Studies on Chironomid Midges in Lakes of the Nikko National Park

Part I. Ecological Studies on Chironomids in Lakes of the Nikko National Park

Masayuki YASUNO, Toshio IWAKUMA, Yoshio SUGAYA and Manabu SASA

Part II. Taxonomical and Morphological Studies on the Chironomid Species Collected from Lakes in the Nikko National Park

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Part I

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INTRODUCTION

The Nikko National Park is located in the mountainous and volcanic area of northern Kanto District, Honshu, Japan and has been noted for rich fauna and flora indigenous to Central Japan. There are several lakes in this park, most of which freeze in the winter. Fig. 1 shows the location and size of these lakes in this area. The morphometric data for these lakes are summarized in Table 1. The altitude of the lakes range from 1269 m above sea level of Lake Chuzenji to 1731 m of Lake Sugenuma. As shown in the map, Lake Sugenuma connects to Lake Marunuma, and Lake Yunoko and Lake Sainoko are connected to Lake Chuzenji. These lakes are different in the trophic state and therefore have attracted limnologists for many years. Among them, Lake Yunoko had well studied during IBP (Shiraishi *et al.*, 1970; Sekine and Tsuchiya, 1972). As far as chironomids, several studies had been made so far (Miyadi, 1932; Shiraishi, 1964; Kitagawa, 1974, 1978). However, these were all based on examination and identification with the larval stage, and thus the scientific names applied were all ambiguous or mistaken.

Surveys were made in Lake Yunoko in April and November 1979, July and September 1980 and in Lake Marunuma, Lake Suugenuma, and Lake Sainoko in July and September 1980. Lake Chuzenji was surveyed in May and August 1981. Additional collections of adult chironomids or larvae were made occasionally in 1976 and afterwards.

A part of the results based on examination of larvae collected from bottm sediments of these lakes were reported by Yasuno *et al.*, (1982). The taxonomic and morphological studies on various stages of the chironomids collected from this region are also reported in a subsequent paper by Sasa (1984).

METHODS

Samplings of lake mud were made by an Ekman-Birge grab at profundal zones and by a scoop net at littoral zones. The dredged area by the scoop net was 30 cm × 50 cm. Usually 8 samples were taken from each sampling site, half of which were washed through a fine mesh sieve at the site or the laboratory and another half were served for the emergence of adults. The methods to recover the adults from the mud samples were described in the previous paper (Sasa *et al.*, 1980). In addition, adult midges were collected on shore of lakes with insect nets while they are swarming in the air or resting on structures or in bushes.

Limnological data measured in these lakes were temperature, pH, dissolved oxygen, transparency, and chorophyll *a*. The first three were measured by thermistor-thermometer and electrodes (Hydrolab 8000). The amount of chlorophyll *a* was determined by UNESCO/SCOR method.

The analysis of sediments was made only for Lake Yunoko, where sediments were collected by a core sampler (39 mm inner diameter) at fixed sampling stations. The surface layer of 5 cm of the sediments was provided for the analysis after dried at 40°C for 48 hours and then at 105°C for 24 hours and homogenized. Loss on ignition

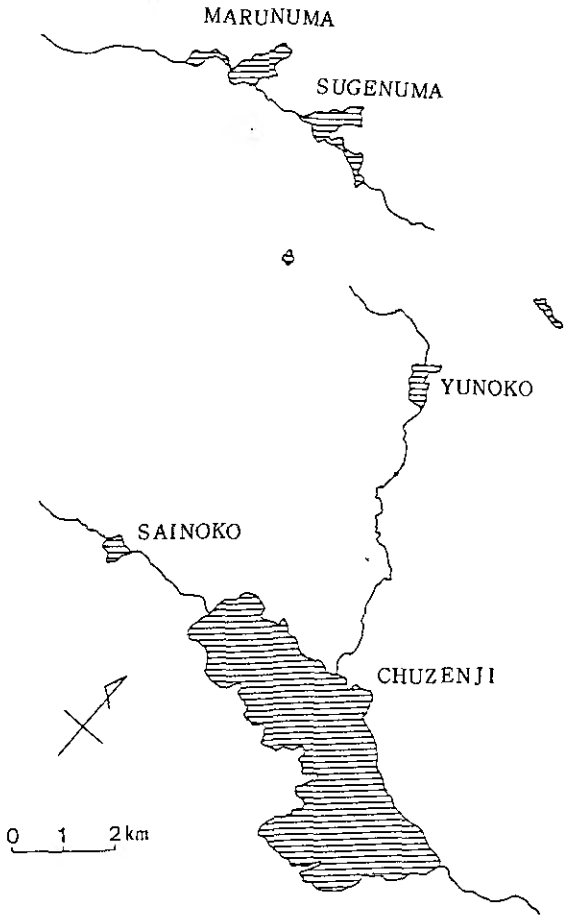

Fig. 1. Map showing the location of lakes in the Nikko National Park

Table 1. Morphometry of five lakes in the Nikko National Park

Lake	Altitude (m)	Maximum Depth (m)	Mean Depth (m)	Area (km^2)	Ice cover period
Yunoko	1,475	12.5	5.2	0.32	Dec.—Apr.
Sugenuma	1,731	74	38.1	0.85	〃 (partly)
Marunuma	1,423	45	31.1	0.45	〃
Sainoko	1,305	17.1	—	0.17	〃
Chuzenji	1,269	163	96.4	11.62	—

was determined by weighing the mud samples before and after burning at 550°C for 3 hours. Water contents was also determined from the change of weight after dried at 105°C. The amounts of total *a* pigment (chlorophyll *a* plus its phaeopigments) and of carotenoid in the sediments were determined spectrophotometrically after extracting from wet mud in 90% acetone for 1 day at 5°C.

RESULTS

Lake Yunoko

Sampling points were selected on a line from the north shore to the centre of the lake (Fig. 2). Those were identical to the points by Shiraishi (1964). The sampling points A-1 and A-2 at north are sandy and samplings were made by a scoop net. There was a heavy stand of *Elodea densa* between A-3 and A-4,which made difficult smapling by an Ekman-Birge grab but was important as the habitat for some species of chironomids as described below. The bottom of the lake is rather flat and therefore the depth does not change much from A-6 to A-8. The littoral zone of the Shirobuna side (B-1 and B-2) has been covered with gravel.

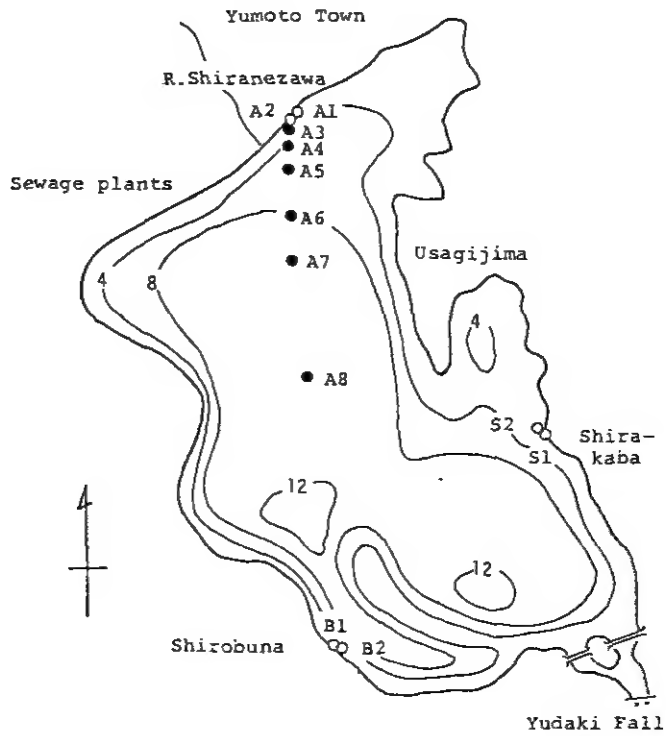

Fig. 2. Map showing the sampling stations in Lake Yunoko

This lake had been classified into mesotrophic lake in the previous studies, but it likely belongs to eutrophic lake now, since the transparency with Secchi disc was only 1 m in August and 2 m in September 1980. The amount of chlorophyll *a* reached 132.3 mg m^{-2} in September. No clear thermal stratification was observed in July but there was a thermocline between 2—4 m in August and September. Dissolved oxygen declined sharply with depth and the hypolimnion over 8 m in depth was anaerobic during the summer (Fig. 3).

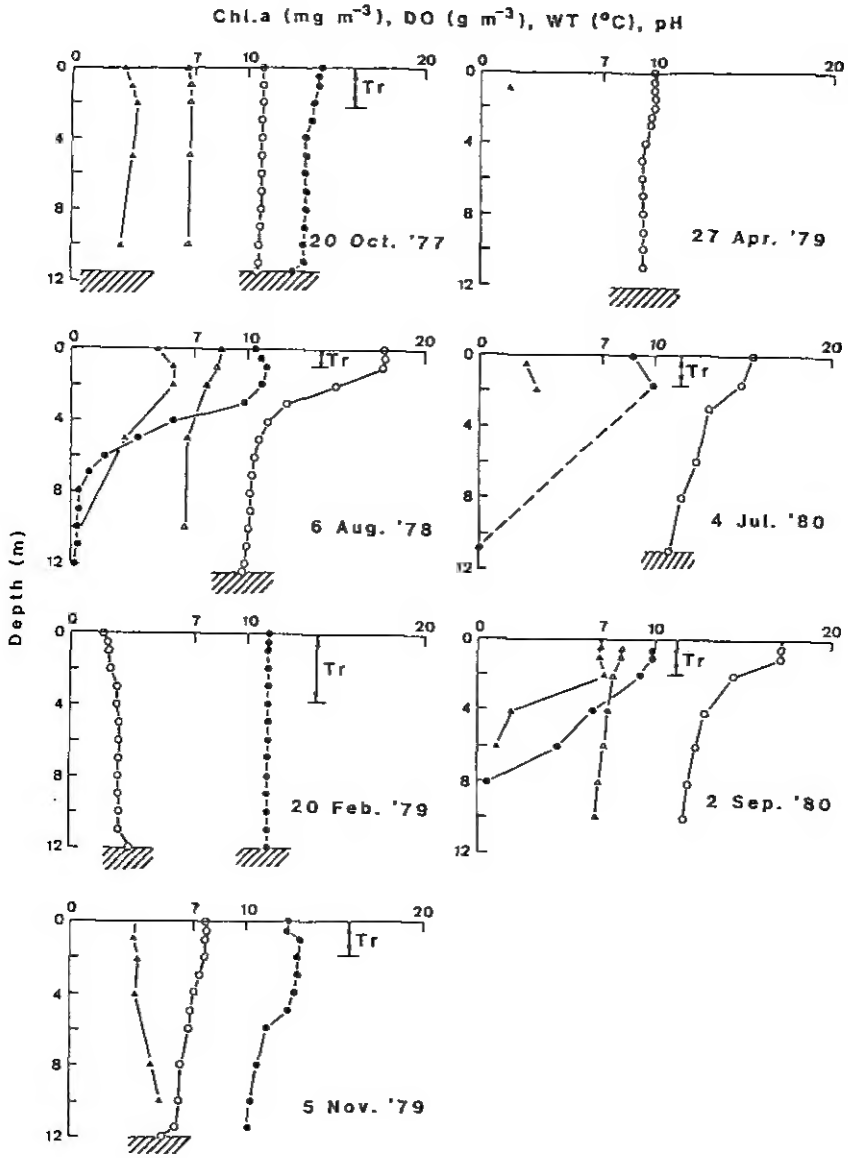

Fig. 3. Limnological data—depth profiles in Lake Yunoko in various months
Solid trianges: chlorophyll *a*, open triangles: pH, open circles: water temperature, solid circles: dissolved oxygen, and Tr: transparency.

There is a trend of increase in the content of nitrogen and carbon and loss on ignition of sediments with depth (Fig. 4a), because the quantities of sediments are proportional to the depth of water column. However, there were marked peaks of the contents at the zones of 4 m and 10 m in depth, respectively Likewise, the quantities of pigments of both allocthonous and autocthonous matter were largest at the station of 10 m in depth (Fig. 4b).

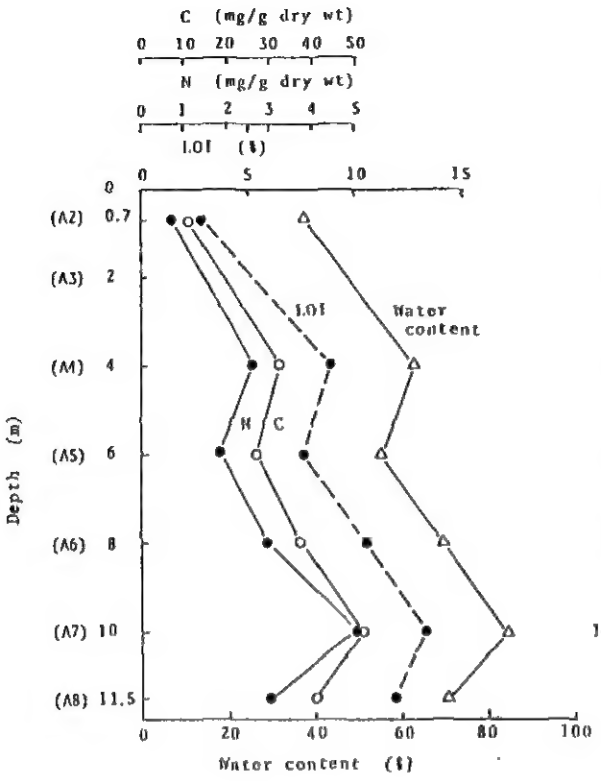

Fig. 4a. Analysis of sediments collected at various depths in Lake Yunoko

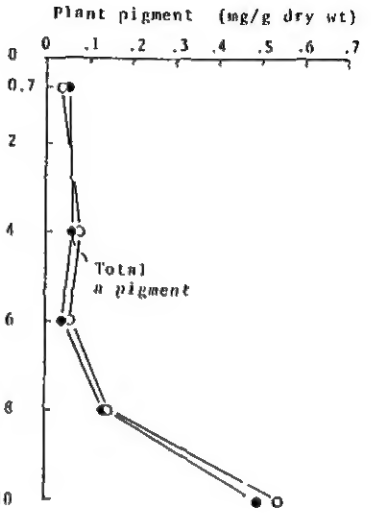

Fig. 4b. Pigment contents of sediment—depth profile in Lake Yunoko

Sediment samples on 27 April contained nine species and those on 5 November contained 11 species (Tables 2 and 3). Species were identified at larval stage. Later, we examined adults and pupal exuviae and confirmed the existance of at least three species of *Tanytarsus*, i. e. *Tanytarsus gregarius* Kieffer, *Tanytarsus yunosecundus*, n. sp. Sasa, and *Tanytarsus* sp. In addition, *Micropsectra yunoprima*, n. sp. Sasa, *Chironomus yoshimatsui* Martin & Sublette, and *Cricotopus trifasciatus* were collected and identified at adult stage. Therefore, the number of species was 17 in total.

Chironomids were distributed more in the littoral zone than in the profundal zone and a marked decline in the number of species according to the depth was recognized in April. The most abundant species was *Psectrocladius* which reached 14400 m^{-2} at A-3 (2 m deep). *Dicrotendipes* was also abundant at the same depth. *Chironomus nipponensis* was distributed most widely from 0.7 m to 11.5 m in depth, although the density was very low at the depth of 10 m or more (A-7 and A-8). The larvae of this species, which were the largest in size, had matured at this time and therefore constituted a large portion of the total standing crop of chironomid larvae in this lake. *Stictochironomus* and *Tanytarsus* were also extending their distributions to the deeper zones. However, the former had a peak at 0.7 m in the profile of a depth—density curve and the latter had it at 6 m. Such a marked zonation in the distribution of the

chironomid species according to depth was not found in November (Table 3). Again, the zone of 2 m contained more species. *Psectrocladius*, which was most numerous in April, decreased in number. *Tanytarsus* was also a few in this month. Instead, *Ablabesmyia* increased and *Phaenopsectra kizakiensis* appeared at the depths of 2 m and 4 m. *Polypedilum* extended its distribution to 6 m. *Stictochironomus akizukii* and *Chironomus nipponensis* were predominating in the biomass as well as the numbers. These two species were slightly different in the distribution: The former was found near the shore and the highest density was observed at 0.7 m in April and at 0.3 m in November. While, the latter was not found at the shallow region.

Table 2. Distribution of chironomid larvae (No.m^{-2}) in Lake Yunoko on 27 April 1979

Station	A1	A2	A3	A4	A5		A7	A8
depth(m)	0.3	0.7	2	4	6	8	10	11.5
Cricotopus yunoquintus	–	10	–	–	–	–	–	–
Ablabesmyia sp.	10	–	10	–	–	–	–	–
Psectrocladius yunoquarts	80	330	14,400	–	–	–	–	–
Procladius sp.	–	–	20	–	–	–	–	–
Polypedilum nubeculosum	140	680	520	60	–	–	–	–
Dicrotendipes lobiger	–	270	3,400	10	70	10	–	–
Stictochironomus akizukii	340	860	130	90	40	30	10	–
Tanytarsus yunosecundus	–	180	370	100	520	10	10	–
Chironomus nipponensis	–	1,630	1,700	2,360	3,640	1,280	280	10
Pupae (not identified)	–	–	–	–	–	–	10	10

Table 3. Distribution of chironomid larvae (No.m^{-2}) in Lake Yunoko on 5 November 1979

Station	A1	A2	A3	A4	A5	A6
depth(m)	0.3	0.7	2	4	6	8
Cryptochironomus sp.	10	–	–	–	–	–
Monodiamesa sp.	10	–	–	–	–	–
Ablabesmyia sp.	–	–	1,330	–	–	–
Psectrocladius yunquartus	–	–	170	–	40	–
Procladius sp.	–	–	–	180	–	–
Polypedilum nubeculosum	180	80	800	90	40	–
Dicrotendies lobiger	–	10	1,380	–	–	–
Stictochironomus akizukii	320	10	360	360	90	–
Phaenopsectra kizakiensis	–	–	220	90	–	–
Tanytarsus sp.	–	–	–	–	40	–
Chironomus nipponensis	–	–	1,730	5,780	160	1,070

As shown in the results of the limnological surveys made at various months, chlorophyll *a* concentration became high in the summer (Fig. 3). Consequently, the oxygen had been depleted at the deeper zones in the summer. The oxygen concentration is of primary importance to determine the distribution of chironomids, and the zonation of chironomids found in April must be reflecting the vertical distribution of oxygen content. Namely, *Chironomus nipponesis* is most tolerable to the low oxygen concentraoion and the other species show the respective tolerance.

The high primary production of this lake supported the high standing crop of chironomids also. The organic matter in the sediments seemed to be sufficient for their food. The stand of *Elodea* at the depth of 3—4 m might provide more food as well as more habitats, allowing the inhabitation of numerous species.

It is not easy to explain the abundance of the pigments in the sediments taken from the depth of 10 m. Since only a few chironomids were distributed to the depth, the precipitated algae might be saved from feeding by chironomids, but anaerobic condition itself might slow down the decomposition of the pigments.

Lake Marunuma

Six points of various depths were selected from the shore to the centre of the Lake for samplings. Chironomid larvae were sorted only from the samples of September. No larvae were found from the depth of 40 m. *Chironomus nipponensis* and *Stictochironomus akizukii* were distributed from 0.5 m to 30 m (Table 4). At the depth of 20 m, a few *Procladius* joined to the above two species but at 10 m, four other species appeared. *Polypedilum* was found adundantly at the shallowest zone but none from 5 m. This lake is not so productive as Lake Yunoko but oxygen decreases with depth and the hypolimnion becomes anaerobic in the summer (Fig. 5). In September, the water temperature was decreasing gradually from the surface to the 30 m depth, whereas oxygen started to decrease from 25 m and was nearly depleted at 40 m in depth. Thus, the profile of the oxygen concetration agreed to the distribution of chironomids.

Table 4. Distribution of chironomid larvae (No. m^{-2}) in Lake Marunuma on 3 September 1980.

	Depth (m)					
	0.5	5	10	20	30	40
Tanytarsus sp	360	130	810	–		
Stictochironomus akizuki	130	330	120	60	20	–
Chironomus nipponensis	1,230	90	120	190	80	–
Polypedilum sp	1,390	–	–	–	–	–
Synchironomum sp	–	200	30	–	–	–
Cryptochironomus sp	–	20	30	–	–	–
Pentaneurini	–		10	–		
Procladius sp	10		10	40		
Psectrocladius sp	10	–		–		

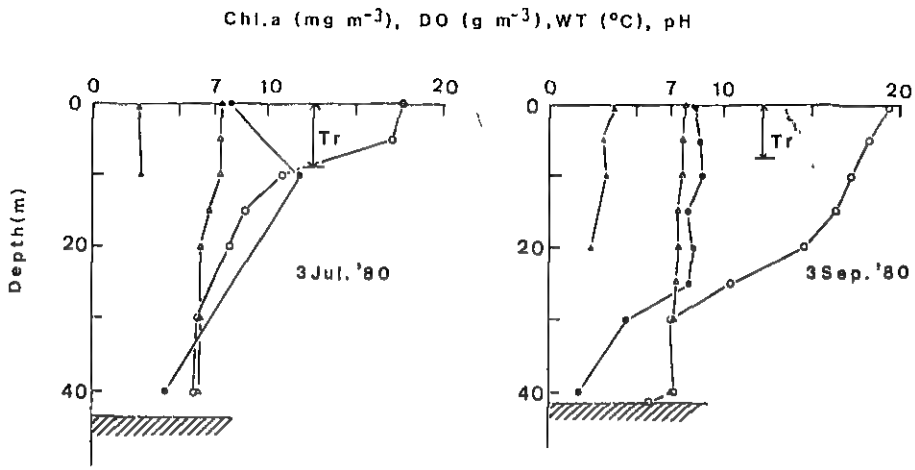

Fig. 5. Limnological data—depth profiles in Lake Marunuma in July and September 1980
Symbols are the same as in Fig. 3.

Lake Sugenuma

This lake composed of two portions; Kitamatanuma basin is deep and oligotrophic (Fig. 6) but Shimizunuma basin is shallower (25 m) and more productive (Fig. 7). The limnological data of the former in July 1980 were similar to those of Lake Marunuma. The transparency was around 10 m. While, it was only 5 m in

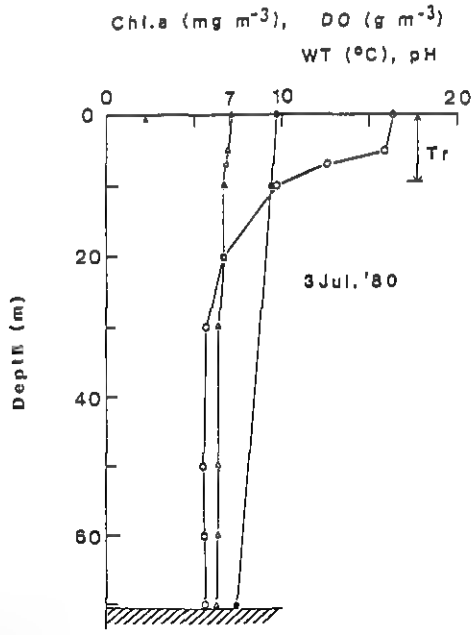

Fig. 6. Limnological data—depth profiles in Lake Sugenuma (Kitamatanuma basin) in July 1980
Symbols are the same as in Fig. 3.

Shimizunuma basin in July, and the concentration of chlorophyll *a* was higher in Shimizunuma than in Lake Marunuma or Kitamatanuma basin. Consequently, the oxygen profile in Shimizunuma basin is similar to that in Lake Yunoko. In September when the chironomid samples were taken, quite a little oxygen was detected at the depth of 20 m, from which only a few *Procladius* were found (Table 5). It was very striking that no or a few *Chironomus nipponensis* could be found at 20 m or at 10 m in depth. We have to assume the presence of anaerobic period at the 10 m depth between July and Septmeber. At 5 m, six species were collected, among which *Phaenopsectra* was the highest in the density.

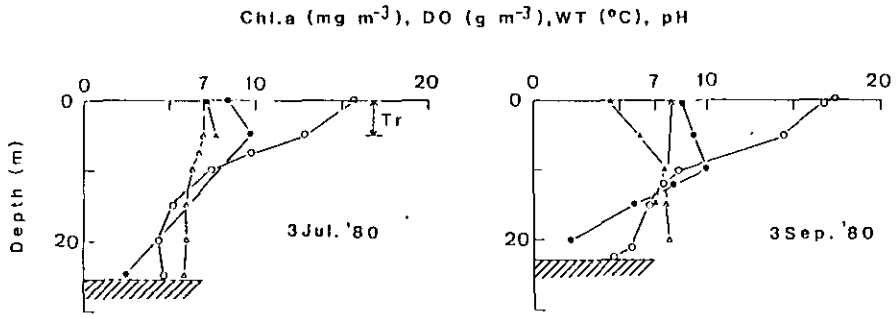

Fig. 7. Limnological data -depth profiles in Lake Sugenuma (Shimizunuma basin) in July and September 1980
Symbols are same as in Fig. 3.

Table 5. Distribution of chironomid larvae (No. m^{-2}) in Lake Sugenuma (Shimizunuma basin) on 3 September 1980.

	Depth (m) 5	10	20
Stictochironomus akizukii	160	–	–
Chironomus nipponensis	240	10	–
Polypedilum sp	360	–	–
Phaenopsectra sp	2,380	–	
Chironomus sp	40	–	–
Procladius sp	470	80	40

Lake Sainoko

This lake is the smallest among the lakes studied and the water level changes widely from season to season. Although the lake is not so productive as far as the concentration of chlorophyll *a* and is not deep, oxygen had been depleted at 15 m in September 1980, possibly because of the clear stratification of the temperature at the 10 m depth (Fig. 8). Only three species of chironomids were found at 10 m and seven species were from 5 m (Table 6). The most abundant species was *Chironomus nipponensis*, which was followed by *Stictochironomus akizukii*. These twe species were seperated in their distribution in this lake also.

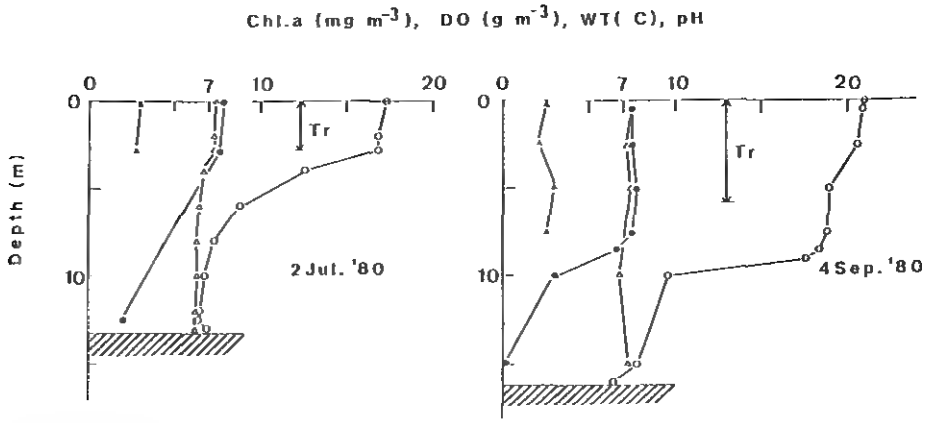

Fig. 8. Limnologial data depth profiles in Lake Sainoko in July and September 1980
Symbols are the same as in Fig. 3.

Table 6. Distribution of chironomid larvae (No.m^{-2}) in Lake Sainoko on 3 September 1980.

	Depth (m)	
	5	10
Tanytarsus sp.	210	–
Stictochironomus akizukii	320	
Chironomus nipponensis	–	1,330
Phaenopsectra sp.	10	90
Synchironomus sp.	10	–
Cryptochironomus sp.	30	
Pentaneurini	10	–
Procladius sp.	10	60

Lake Chuzenji

This largest and deepest lake in the Nikko National Park was surveyed twice. Sampling sites in the lake are shown in Fig. 9. In May 1981, samplings were made at the shore of Shobugahama (B-1 in Fig. 9) by a scoop net and near the shore (B-2, 13 m deep, Fig. 9) by an Ekman-Birge grab. Both the sampling sites were not suitable for collection by these equipments; the shore was sandy and the stand of macrophytes had just started the growth, while the bottom of B-2 had been covered with gravel. Nevertheless, 10 species were found from the examination of larvae (Table 7) and 23 species were recovered examining the adults emerged from the mud samples (Sasa, 1984). The most abundant species in the samples from the shore was *Tanytarsus chuzesecundus*, n. sp. Sasa. *Monodiamesa*sp., and *Orthocladius chuzeseptimus*, n. sp. Sasa were also abundant at this place. While, only five speices were collected from the depth of 13 m. *Chironomus nipponensis* and *Stictochironomus* spp. were present there.

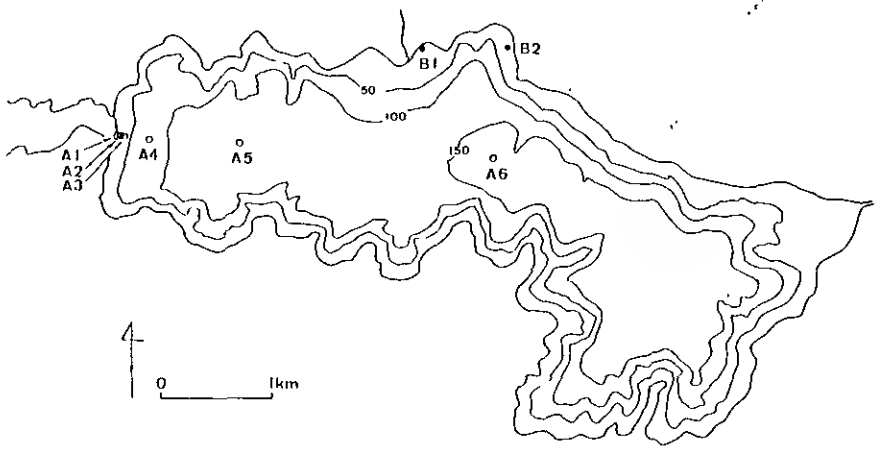

Fig. 9. Map showing the sampling stations in Lake Chuzenji

Table 7. Distribution of chironomid larvae (No. m^{-2}) in Lake Chuzenji in 1981

	May 1981		August 1981		
Station	B−1	B−2	A−1	A−2	A−3
Depth (m)	1	13	1	10	30
Monodiamesa sp	1,240	20	400	−	−
Orthocladius spp	800	−	−	−	−
Cricotopus sp	−	−	110	−	−
Orthocladinae genus sp		20	20	−	−
Stictochironomus spp[2]	560	310	360	40	80
Chironomus nipponensis	−	380	−	130	270
Phaenopsectra Kizakiensis	360	−	−	−	230
Polypedilum sp A[3]		−	90	−	−
Polypedilum sp B[4]	20	70	110	−	10
Cryptochironomus sp A	70		−		
Cryptochironomus sp B		−	20	−	
Tanytarsus chuzesecundus	1,820	−		−	−
Tanytarsus sp A		−	580	−	−
Tanytarsus sp B			20	−	−
Tanytarsus sp C	−	−	−		10
Micropsectra chuzeprima	40	−		−	
Micropsectra sp	−		−	−	20
Procladius sp	−	−	−	40	
Pentaneurin. genus sp	−	−		−	10

1 Including *Orthocladius chuzesextus* and *O. chuzeseptimus* which could not be distinguished at larval stage
2 Including both *Stictochironomus akizukii* and *S. multannulatus*
3 Larva of this species could be distinguished from the next species by the shorter antennal segments
4 This could be *Polypedilum asakawaense* or *P. nubeculosum*

On 27 August 1981, samplings were made at six points selected on a line from Senjugahama to the centre of the lake. No chironomid larvae, however, were recovered from A-4 (80 m), A-5 (120 m), and A-6 (150 m). Near the shore (A-1), nine species were collected, of which *Tanytarsus* sp. and *Monodiamesa* sp. were predominating. At 10 m or 30 m, less numbers of species were recovered, which included *Stictochironomus* spp. and *Chironomus nipponensis*. We are not sure that *Phaenopsectra* sp. found from the 30 m depth is a different species from that collected at B-1 in May.

The transparency of this lake had fluctuated around 10 m (Natl. Inst. Environ. Stud., 1984). A clear stratification of water temperature had developed at about 20 m in depth in the summer. Oxygen did not decrease with depth and its concentration at the depth of 150 m was around 10 g m^{-2} in August. However, the water temperture from 80 m downwards had never exceeded 4.7℃. Thus, although oxygen seemed to be sufficient, the temperature was too low to allow the growth of most chironomid species. Chironomid larvae were found at the sampling points of 30 m, where the temperature became 6—7℃ in the summer, while it varied from 2℃ to 18℃ at 10 m. Since the most parts of this lake are deeper than 80 m, the suitable habitat is limited near the shores. This result suggests that the production of benthos in such deep lakes is limited.

The chlorophyll *a* concentration in this lake was 1—2 mg m^{-2} in the summer, resembling that in Lake Marunuma. However, the concentration in November reached to 3 mg m^{-2} (Natl. Inst. Environ. Stud., 1984), possibly because of the autumn circulation.

DISCUSSION

The numbers of species differentiated for Lake Yunoko were 5—7 by previous workers and 18 by us. Table 8 shows a comparison of scientific names of the chironomids reported by them and in our presnt study. All of the four previus wokers reported *Chironomum plumosus* as a predominant species breeding in this lake, but it is undoubtedly a misdiagnosis of *Chironomus. nipponensis* Tokunaga. The adult males of the two species can be very easily differentiated by body coloration and by the structure of hypopygium, but they are rather difficult to be differentiated in the larvae, though they differ in the size of caudolateral processes on the 8th abdominal segment. Likewise, a species reported by Miyadi (1932) as *Endochironomus* sp. seems to include *Stictochironomus akizukii* (Tokunaga) and *Phaenopsectra kizakiensis* (Tokunaga), which can be very easily seperated by body coloration and the presence or absence of macrotrichiae in the adults. In addition, the presence of species of the Chironomini such as *Polypedilum nubeculosum* (Meigen), *Microtendipes chloris* (Meigen), and *Dicrotendipes lobiger* (Kieffer) have been confirmed by examination of adults. In the subsequent paper (Sasa, 1984), at least two species of the tribe Tanytarsini from this lake were differentiated, a large species by a name of *Micropsectra yunoprima*, n. sp., and a small species *Tanytarsus yunosecundus*, n. sp., but both were probably mixed up by the previous workers. The species reported by Miyadi (1932) as Orthocladiinae, and by Shiraishi (1964) and Kitagawa (1978) as *Spaniotoma* sp., seems to include at least three species belonging to different genera, such as *Psectrocladius yunoquartus*, n. sp., *Cricotopus yunoquintus*, n. sp., and *Cricotopus trifasciatus* (Panzet) according to Sasa (1984).

Table 8. A comparison of species lists of chironomids reported from Lake Yunoko by previous workers

Miyadi (1932)	Shiraishi (1964)	Kitagawa (1972)	Kitagawa (1978)	Present study
Chironomus plumosus	*Chironomus plumosus*	*Chironmus plumosus*	*Chironomus plumosus*	*Chironomus nipponensis*
Endochironomus sp.	*Stictochironomus* sp.	*Sergentia* sp.	*Sergentia* sp.	*Stictochironomus akizukii*
Chironomus connectens	–	*Cryptochironomus pararostratus*	*Parachironomus* sp.	*Dicrotendipes lobiger*
Polypedilum sp.	*Polypedilum* sp.	–	–	*Polypedilum nubeculosum*
–	*Microtemdipes* sp.	–	–	*Microtemdipes chloris*
–	–	–	–	*Phaenopsectra Kizakiensis*
–	–	–	–	*Cryptochironomus* sp.
Tanytarsus genuinus	*Tanytarsus* sp.	*Micropsectra* sp.	*Micropsectra* sp.	*Tanytarsus yunosecundus*
Orthocladiinae	*Spaniotoma* sp.	–	*Spaniotoma* sp.	*Psectrocladius yunoquartus*
–	–	–	–	*Cricotopus yunoquintus*
–	–	–	–	*Monodiamesa* sp.
Tanypinae	*Pentaneura* sp	*Pentaneura* sp.	*Pentaneura* sp.	*Ablabesmyia* sp.
–	–	–	*Procladius* sp.	*Procladius* sp.

The situation is much more complicated and confusing in the chironomid fauna Lake Chuzunji, which is much larger, deeper and less eutrophic than Lake Yunoko. Miyadi (1932) reported five species of chironomids by examination of the bottom fauna, i. e. *Chironomus plumosus*, *Chironomus connectens*, *Tanytarsus genuinus* (inermipes-group), Orthocladiinae, and Tanypinae. However, our larval examination recovered 19 species. While, as many as 38 species of chironomids were identified from the examination of adult specimens (Sasa 1984). As for the member of genus *Tanytarsus*, for example, four species were collected from this lake, and a species identified by the present authors as *Tanytarsus gregarius* (Kieffer) was recovered from Lake Yunoko, Lake Marunuma, and Lake Chuzenji.

The common species to the five lakes were *Stictochironomus akizukii* and *Chironomus nipponensis*. Both species were important in the contribution to the standing crops of chironomids in each lake. Some other species are also inhabiting different lakes. In general, three lakes, Lake Marunuma, Lake Sugenuma (Shimizunuma basin), and Lake Sainoko, were similar in the chironomid fauna, although the last is isolated from the former two lakes. Lake Yunoko was slightly different from them, having the characteristic species, *Psectocldius yunoquartus* Sasa

and *Dicrotendipes lobiger* (Kieffer). Lake Yunoko is connected to Lake Chuzenji by the River Yukawa but only six species were found common to them. Lake Chuzenji has specific species such as *Monodiamesa* sp. and *Orthocladius chuzeseptimus*, n. sp. Sasa. However, *Tanytarsus chuzesecundus* which was described as a new species from Lake Chuzenji by Sasa (1984) was confirmed the inhabitation in Lake Sainoko from the pupal exuviae. Since not all the chironomids collected succsessfully emerged in the laboratory, still many species must existing in these lakes. We could not get adults of some species which were differentiated at larval stage. Possibly more species of *Tanytarsus* are inhabiting these lakes; for example, we know two more species of *Tanytarsus* in Lake Sugenuma and one more in Lake Sainoko from the specimens of pupal exuviae.

There is a big difference in the number of species found from these lakes between the previous workers and us. However, the distributions of main species in respective lakes are not different so much. Both Miyadi (1932) and Kitagawa (1974) recorded *Tanytarsus* (or *Micropsectra*) from the bottom deeper than 100 m of Lake Chuzenji, while we could not collect any larvae from the bottom deeper than 80 m. The more careful samplings in various seasons will be needed before giving any conclusion on this distribution. While, Kitagawa (1974) could not recover *Chironomus nipponensis* (or *plumosus*) from this lake but reported a big change in the density of oligochaetes which were rare in 1928. As his study, oligochaetes were found abundantly at the deepest zone of Lake Chuzenji in the present study. Therefore, eutrophication might progress even in this oligotrophic lake since the time studied by Miyadi.

The transparency may indicate the trophic state of lakes. Lake Yunoko showed only 1.8 m of transparency in the summer and chlorophyll *a* concentration was 18.9 mg m^{-2}. Lake Sainoko and Lake Sugenuma (Shimizunuma basin) had the transparency of about 5 m but the chlorophyll *a* concentration was 1.3 in the former and 3.1 mg m^{-2} in the latter. The biomass of chironomids corresponded to these concentrations of chlorophyll *a* indicating the biomass of phytoplankton; the maximums were 10.2, 3.6, and 3.5 mg m^{-2} in Lake Yunoko, Lake Sugenuma (Shimizunma basin), and Lake Sainoko, respectively. The biomass of chironmids in Lake Marunuma was only 1.9 mg m^{-2} while the concentration of chlorophyll *a* was 1.5 mg m^{-2} in the summer. Thus the biomass or production of chironomids closely related to the primary production of lakes. Of course, the concentration of dissolved oxygen and water temperature were important for determining the distribution of chironomids as mentioned in the previous section and we noticed that the depth which provides the maximum biomass of chironomids changes according to the conditions of lakes; namely, it was 2−4 m in Lake Yunoko, 5 m Lake Sugenuma (Shimizuma basin), 10 m in Lake Sainoko, and 20 m in Lake Marunuma.

SUMMARY

Surveys on the chironomid fauna were made in five mountain lakes in the Nikko National Park which are different in the trophic states. Lake Yunoko which was most productive regarding the phytoplankton held the highest biomass of chironomids, whereas the number of species was most abundant in oligotrophic Lake Chuzenji; about 20 species from the larval examination and 38 species from adult specimens. The

species common to all the five lakes were *Stictochironomus akizukii* and *Chironomus nipponensis* which had been misidentfied as *Chironomus plumosus* by the previous workers. The most important finding was the differentiation of species Tanitarsini which had not been distinguished at all. A total of nine species were differentiated at larval or pupal specimens, some of which were given new species name from the recovered adults by the last author. Thus, every lake had two to three species of Tanytarsini. Lake Chuzenji was charactreristic with abundant *Monodiamesa* sp. and *Orthocladius chuzesextus* at the littoral zone. Other lakes were generally similar to each other in the chironomid fauna.

Although the depths of lakes were different, chironomid larvae were absest or a few at the deeper region in respective lakes, because of the lack of oxygen during the summer, which was related with the trophic state of lakes. In the case of Lake Chuzenji, no chironomid larvae could be collected from the bottom deeper than 80 m, although sufficient oxygen was present. The low temperature in the depth throughout the seasons might be suppressing the growth of the most chironomid species.

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日光国立公園の湖沼のユスリカに関する研究

第1部　日光国立公園内湖沼のユスリカの生態学的研究

安野正之[1]・岩熊敏夫[1]・菅谷芳雄[1]・佐々　学[2]

日光国立公園の五つの湖のユスリカ相の調査を行った。湯の湖は植物プランクトンによる一次生産量が最も高くユスリカの現存量も最も多かった。一方貧栄養湖の中禅寺湖は種類数で最も多かった。すなわち、幼虫による検索で20種、成虫によるそれでは38種を記録した。上記二つの湖に西ノ湖、菅沼、丸沼の三つを加えた湖に共通している種は *Stictochironomus akizukii* と *Chironomus nipponensis* の2種であった。後者はこれまで *Chironomus plumosus* と誤同定されてきた。しかもそれによって湖の類型化が行われていたため大変混乱していた。また Tanytarsini が全ったく種を識別していなかったが、本報告で種の区別を行ったことも重要である。幼虫および蛹から9種が識別され、そのうちのいくつかは新種として記載されている。つまり、これまでの研究において1種であった *Tanytarsus* は各湖に2種以上生息していることがわかった。中禅寺湖は沿岸帯に *Monodiamesa* sp. と *Orthocladius chuzesextus* が多数生息している点で特徴的であった。他の4つの湖は一般的にはユスリカ相はよく似ている。

湖の水深は10mから150mまでちがいがあるが、浅い湖でも深い部分にはユスリカは生息していない。浅い湖は生物生産（一次）が高いことから、底付近の溶存酸素は消費され不足がちになるためである。中禅寺湖の場合は深さ150mでも溶存酸素は十分あるが、深さ80mではユスリカを見出せなかった。この深さでは水温は年間を通して常に4℃を越える程度でありその低水温がユスリカのほとんどの種の生長を抑制していることが制限要因になっていると考えられる。

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Studies on chironomid midges in lakes of the Nikko National Park

Part II

Taxonomical and morphological studies on the chironomid species collected from lakes in the Nikko National Park

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CONTENTS

INTRODUCTION

The present paper deals with the morphological descriptions and taxonomic studies of the chironomid species collected by the author and his associates from lakes in the Nikko National Park during a period from 1976 to 1981. The materials used in the present study were mainly the adult males emerged from bottom sediments of the two important lakes, Yunoko and Chuzenji, and the pupal exuviae associated with the adults when they were available. Adult chironomids resting or swarming on the shore of these and other lakes were also collected and examined. The methods of collection of adults and immature stages, their laboratory rearings, and of preservation, dissection and mounting are as reported in the previous papers by Sasa (1981a, b, 1983a, b). As a result, a total of 41 species belonging to subfamilies Chironominae, Orthocladiinae and Diamesinae (not including those belonging to Tanypodinae) were identified, and the stages described.

RECORD OF COLLECTIONS

(1) Lake Yunoko

A. Collection of adult chironomids on the shore.

28 July 1976, by M. Sasa and A. Shirasaka

28 and 29 April 1979, by M. Sasa. In this collection, a total of 5 species were collected at 9 different sites on the bank of this lake, *i.e.* 64 males and 56 females of *Chironomus nipponensis*, 6 males of *Stictochironomus akizukii*, 38 males and 45 females of *Phaenopsectra kizakiensis*, and 112 males and 75 females of *Psectrocladius yunoquartus*, all resting on the walls of houses, on signboards and in bushes; 22 males of *Micropsectra yunoprima* were collected also at 2 sites which were swarming in the air.

6 and 7 May 1981, by M. Sasa. Altogether 8 species were collected, 2 males and 8 females of *Chironomus nipponensis*, a male and 3 females of *Stictochironomus akizukii*, 39 males and 13 females of *Phaenopsectra kizakiensis*, 4 males and 3 females of *Tanytarsus tamagotoi*, a male of *Tanytarsus gregarius*, 41 males and 26 females of *Psectrocladius yunoquartus*, and 4 males of *Diplocladius cultriger*.

B. Collection from bottom samples

Five bottom samples were collected with Ekman-Birge grab in February 1979 by T. Iwakuma. By laboratory rearing of these samples, 8 species of chironomid adults were collected, as in Table 2.

Twelve samples were collected on 27 and 28 April 1979 by T. Iwakuma and Y. Sugaya at various depths of this lake. Nine species of chironomid adults emerged from the samples, their distribution according to the depth of the collection sites is in Table 3, and the numbers of adults of each species classified by the days of laboratory culture is in Table 4.

From 2 bottom samples collected at depths of 1 m and 6 m on 8 May 1981, 2 males and 7 females of *Chironomus nipponensis*, 5 males and a female of *Dicrotendipes lobiger*, 2 males of *Tanytarsus gregarius*, a male of *Tanytarsus tamanonus*, and a male of *Tanytarsus chuzesecundus* were recovered by laboratory rearings.

(2) Lake *Chuzenji*

A large number of chironomid species have been recovered from this large, deep and relatively unpolluted lake through these surveys. As shown in Table 1 a total of 32 species of chironomids have been collected from bottom sedimens or on the shore of this lake. The numbers of adults males and females of various species emerged from 6 bottom samples collected in April 1979 are in Table 5, and their recoveries according to the culture of day in Table 6.

(3) Lake Sainoko

In the collection of adult chironomids resting on the shore of this lake on 7 May 1981, a male of *Phaenopsectra kizakiensis* and 6 males of *Smittia sainokoensis* were captured.

(4) Lake Marunuma

Three females of *Stictochironomus akizukii* emerged from samples collected on 7 May 1981. Eight males and 2 females of *Phaenopsectra kizakiensis*, and 2 females of

Diplocladius cultriger were captured on the bank of Lake Marunuma on 7 May 1981.

Table 1. Distribution, stages described, figure numbers, and pages of description of the chironomid species collected from Nikko

[Stages M male, F female, P pupa, L larva
Distribution C Chuzenji, R Marunuma, W Sainoko,
Y Yunoko, ( ) from stream, *adult collected on shore]

No	Species collected	Distribution	Stages described	Figure No
1	*Micropsectra yunoprima*, n sp	C Y	M P	1–3
2	*Micropsectra chuzeprima*, n sp	C	M F P L	4 7
3	*Micropsectra chuzenotescens* n sp	C	M F P	8–10
4	*Micropsectra chuzelonga*, n sp	C	M P	11–13
5	*Tanytarsus yunosecundus*, n sp	Y	M F P L	14–17
6	*Tanytarsus chuzesecundus* n sp	C	M F P L	18 21
7	*Tanytarsus gregarius* Kieffer	C Y	M P	22–24
8	*Tanytarsus tamanonus* Sasa	C		
9	*Tanytarsus tamagotoi* Sasa	C		
10	*Chironomus nipponensis* Tokunaga	C Y		
11	*Chironomus yoshimatsui* Martin & Sublette	Y		
12	*Dicrotendipes lobiger* (Kieffer)	Y	M F P L	25 28
13	*Paracladopelma camptolabis* Kieffer	C	M P	29, 30
14	*Demicryptochironomus chuzequartus* n sp.	C	M P	31, 32
15	*Stictochironomus akizuki* (Tokunaga)	C Y R W	M F P L	33–37
16	*Stictochironomus multannulatus* (Tokunaga)	C	M F P	38–40
17	*Phaeno sectra kizakiensis* (Tokunaga)	Y	M F P L	41 44
18	*Microtendipes chloris* (Meigen)	Y	M	45 46
19	*Polypedilum nubeculosum* (Meigen)	C Y	M F P L	47–50
20	*Polypedilum asakawaense* Sasa	C W	M	51
21	*Polypedilum tamanigrum* Sasa	C	M	51
22	*Polypedilum* sp "chuzetripodrum"	C	M	52
23	*Polypedilum tamagohanum* Sasa	C	M P L	52 54
24	*Polypedilum* sp "chuzenudum"	C	M	54
25	*Orthocladius chuzesextus* n sp	C	M F P L	55 58
26	*Orthocladius chuzeseptimus* n sp	C	M F P L	59–63
27	*Psectrocladius yunoquartus* n sp	C Y	M F P L	64–67

Table 1. (Continued)

No	Species collected	Distribution	Stages described	Figure No
28	*Eukiefferiella chuzeoctavus* n sp	C	M	68
29	*Eukiefferiella chuzenonus* n sp	C	M	69
30	*Paratrichocladius tamaater* Sasa	C	M P	70, 71
31	*Cricotopus yunoquintus* n sp	Y	M F P L	72–74
32	*Cricotopus trifasciatus* (Panzer)	C Y	M F P L	75 78
33	*Brillia longifurca* Kieffer	(C)	M F P	79, 80
34	*Diplocladius cultriger* Kieffer	Y*	M	81, 82
35	*Parametriocnemus chuzedecimus* n sp	C	M F P L	83 85
36	*Limnophyes tamakireides* Sasa	(C)	M F	86
37	*Smittia sainokoensis* n sp	W*	M F	87
38	*Epoicocladius chuzeundecimus* n sp	C	M F	88, 89
39	*Thienemanniella chuzeduodecimus* n sp	(C)	M	90
40	*Prodiamesa* sp	C	M F P L	91–94
41	*Syndiamesa* sp	C*	M	95
42	*Ablabesmyia* sp	C Y		
43	*Procladius* sp	C		
44	*Tanypus* sp	C		
45	*Pentaneura* sp	C		
46	*Anatopynia* sp	C		

Table 2. Numbers of adult chironomids emerged from bottom samples collected at various depths of Lake Yunoko in February 1979

left male, right (in italic) female

Collection site	A	B	C	D	E
(depth in meters)	0	0	4m	7m	12m
Chironomus nipponensis			11 *4*	21 *20*	7 *2*
Phaenopsectra kizakiensis	1 *1*		2	*1*	5 *2*
Stictochironomus akizuki	13 *12*	6 *9*			
Polypedilum nubeculosum		2			
Dicrotendipes lobiger	2 *1*	2			
Tanytarsus yunosecundus		1 *1*			
Cricotopus yunoquintus	1	8 *1*			
Psectrocladius yunoquartus	1	4 *2*			
Total	18 *14*	23 13	13 *4*	21 *21*	12 *4*

Table 3. Numbers of adult chironomids recovered from bottom sediments of Lake *Yunoko* by the laboratory rearing. I. Classification by the sampling sites

Code No	Collection sites	I	K	G	H	D	E	F	J	L	S	T	U	Total	
	Depth (meters)	11	10	8	6	4	2	0.7	0.3	0.3	0.3	0.3	0.3	Male	Female
27	*Psectrocladius yunoquartus*					1 *1*	11 *9*	68 *95*		1	1			82	*105*
31	*Cricotopus trifasciatus*							9 *5*	1		*1*			10	*6*
10	*Chironomus nipponensis*	*3*	5 *8*	7 *6*	7 *7*	16 *11*	2 *2*	18 *15*					13 *8*	68	*61*
11	*Chironomus yoshimatsui*							*1*							*1*
12	*Dicrotendipes lobiger*		1 *1*				10 *9*	59 *62*			9 *5*	1		80	*77*
15	*Stictochironomus akizukii*					*1*		11 *10*	5 *4*			2 *4*	3 *4*	21	*23*
19	*Polypedilum nubeculosum*						1	36 *32*			26 *23*		8 *5*	71	*60*
5	*Tanytarsus yunosecundus*		1		*1*	1		2 *3*						4	*4*
42	*Ablabesmyia* sp.					6 *3*		6 *5*						12	*8*
													Total:	348	*345*

Table 4. Numbers of adult chironomids recovered from bottom sediments of Lake *Yunoko* by the laboratory rearing. II. Classification by the days of culture

Code No.	Species	Days of laboratory culture												Total	
		0 10		11–20		21–30		31–40		41 50		51–60		61–70			
27	*Psectrocladius*	42	*43*	27	*42*	7	*6*	5	*9*	1	*2*		*3*			82	*105*
31	*Crico. trifas.*					8	*4*	1	*1*	1	*1*					10	*6*
10	*Chir. nippon.*	5	*5*	4	*13*	17	*16*	22	*12*	15	*8*	2	*5*	3	*2*	68	*61*
11	*Chir. yoshim.*								*1*								*1*
12	*Dicrotendipes*		*1*		*1*	4	*2*	4		52	*46*	19	*27*	1		80	*77*
15	*Stict. akizukii*	1	*3*		*4*	9	*7*	9	*4*	1	*5*	1				21	*23*
19	*Polypedilum*			1		14	*5*	38	*37*	17	*16*	1	*2*			71	*60*
18	*Microtendipes*												*1*				*1*
5	*Tany. yunosec.*					2	*2*	2			*1*		*1*			4	*4*
42	*Ablabesmyia*					2	*1*	6	*5*	4	*2*					12	*8*
																348	*345*

Left: male, right (in italic): female
Room temperature: 0–19 days–10°C; 20 days and after–20°C

Table 5. Numbers of adult chironomids recovered from bottom sediments of Lake Chuzenji by the laboratory rearings. I. Classification by the sampling sites.

Code No	Sampling site	A		B		C		M		N		O		Total	
	Depth (meter)	28		9		07		07		07		07		Male	Female
25	*Orthocladius chuzesextus*				1	9	4	3	4	14	17	5	9	31	35
26	*Orthocladius chuzeseptimus*			1		38	35	30	46	53	64	67	82	189	227
27	*Psectrocladius junoquartus*					10	8			14	23	3	7	27	38
35	*Parametriocnemus chuzedecimus*	4	2	6										10	2
32	*Cricotopus trifasciatus*					2	1		1	1			3	3	5
28	*Eukiefferiella chuzeoctavus*									3				3	
29	*Eukiefferiella chuzenonus*									2		1		3	
30	*Paratrichocladius tamaater*									3				3	
15	*Stictochironomus akizukii*			5	3	3			3	2	2	4	1	14	9
16	*Stictochironomus multannulatus*					4	15	5	10	1	3	4	4	14	32
19	*Polypedilum nubeculosum*					31	16			2	6	4		37	22
22	*Polypedilum "chuzetripodurum"*							1							
20	*Polypedilum akasawaense*							3	1	2	3		1	6	5
21	*Polypedilum tamanigrum*									1				1	
23	*Polypedilum tamagonanum*									1				1	
14	*Demicryptochironomus chuzequartus*						2		2					2	2
13	*Paracladopelma camptolabis*				1			2	1					2	2
6	*Tanytarsus chuzesecundus*	1	1	2		14	21	14	13	9	5	7	3	47	43
2	*Micropsectra chuzeprima*	2	3											2	3
40	*Prodiamesa* sp									1				1	
43	*Procladius* sp				1				1						2
44	*Tanypus* sp					2	3							2	3
42	*Ablabesmyia* sp					2	3	1						3	3
45	*Pentaneura* sp						4			1	1		1	1	6
46	*Anatopynia* sp							1						1	
													TOTAL	404	439

Table 6. Numbers of adult chironomids recovered from bottom sediments of Lake Chuzenji. II. Classification by days of culture

(Room temperature. 0-19 days—10°C; 20th day and thereafter—20°C)

Code No.	Species	Days of laboratory culture														Total	
		0—10		11—20		21—30		31—40		41—50		51—60		61—70			
25	*Orthocladius chuzesextus*	1	*4*	24	*22*	6	*9*									31	*35*
26	*Orthocladius chuzeseptimus*	4	*5*	20	*22*	47	*44*	31	*29*	65	*70*	18	*38*	4	*19*	189	*227*
27	*Psectrocladius yunoguartus*	5	*5*	4	*7*	11	*9*	7	*14*		*3*					27	*38*
35	*Parametriocnemus chuzedecimus*	5		4	*1*	1			*1*							10	*2*
32	*Cricotopus trifasciatus*					1	*4*	1	*1*	1						3	*5*
28	*Eukiefferiella chuzeoctavus*			3												3	
29	*Eukiefferiella chuzenonus*					1		2								3	
30	*Paratrichocladius tamaater*					3										3	
15	*Stictochironomus akizukii*		*1*			3		4	*5*	1	*2*	2	*1*	3		14	*9*
16	*Stictochironomus multannulatus*							6	*3*	7	*24*	1	*5*			14	*32*
19	*Polypedilum nubeculosum*					13	*8*	21	*13*	3	*1*					37	*22*
22	*Polypedilum chuzetripodurum*									1						1	
20	*Polypedilum akasawaense*					1	*1*	4	*4*	1						6	*5*
21	*Polypedilum tamanigrum*							1								1	
23	*Polypedilu tamagohanum*					1										1	
14	*Demicryptochironomus chuzequartus*							2	*1*		*1*					2	*2*
3	*Paracladopelma camptolabis*							2	*1*		*1*					2	*2*
6	*Tanytarsus chuzesecundus*					21	*15*	13	*15*	10	*13*	3				47	*43*
2	*Micropsectra chuzeprima*			2	*3*											2	*3*
40	*Prodiamesa* sp.			1												1	
43	*Procladius* sp.						*1*		*1*								*2*
44	*Tanypus* sp.			1		1					*3*					2	*3*
42	*Ablabesmyia* sp.					2	*2*		*1*	1						3	*3*
45	*Pentaneura* sp.									1	*6*					1	*6*
46	*Anatopynia* sp.					1										1	
															TOTAL	404	*439*

Left: number of males; right (italic): number of females

Room temperature: days 0-30, 10°C, days 31-80, 20°C

DESCRIPTION OF SPECIES

(1) *Micropsectra yunoprima.* sp. nov.

Materials studied. Males swarming at two different sites on the shore of Lake Yunoko were collected with insect nets on 28 April 1979. 9 males were dissected and mounted in gum chloral (holotype and paratypes, No. A 36:91—98). A pupal skin of this genus was collected among large numbers of pupal exuviae floating on the surface of the lake on the same day (No. A 36:90). A total of 149 males and 20 females were collected also while swarming in the air at 3 sites on the shore of Lake Chuzenji with insect nets on 8 May 1981, among which 5 males and 3 females were mounted on slides (No. A 51:01 06).

Male. Body length 4.97-5.51mm (5.26±0.19mm, average of 10 specimens), wing length 3.74-4.07mm (3.93±0.11mm). Body almost uniformly black; ground color of scutum black and pruinose, scutal stripes shining black, scutellum, postnotum, halteres, legs and abdominal tergites all black.

Head in Fig. 1-A. Antenna with 13 flagellar segments, AR 2.72—3.15 (2.87± 0.14, 10 specimens), tip in Fig. 1-B. Antennal hairs long, AHR 0.67. Small frontal tubercles present, 14 microns high, 10 microns wide, and 114 microns apart from each other (Fig. 1-G). Supraorbital setae 15-18 on each side; clypeal setae 36—46. Eyes with a long and narrow dorsomedial projection, ER 0.29—0.36.

Antepronotum highly reduced in the middle and overhung by anterior projection of scutum; thorax in Fig. 1-C; dorsomedian setae 8—10, dorsolateral setae 14 16; prealar setae 2—4; scutellar setae 12 16 in uniserial row. Wing relatively narrow, anal lobe rather flat. Squama bare. Wing membrane almost colorless and with sparcely distributed macrotrichiae. Wing venation in Fig. 1-F. R 2+3 ending about midway between tips of R 1 and R 4+5 (R 2+3 ending at 0.41—0.50 of wing length; 0. 44 in average of 6); r-m almost parallel to wing axis; fCu nearly under r-m (venarum ratio 0.97 1.03, 1.00 in average of 6). LR1 1.03 1.08 (1.06), LR2 0.46—0.52 (0.49), LR3 0.54—0.59 (0.57). Tarsi I to IV of front leg as well as femora, tibiae and tarsi I to IV of middle and hind legs with long beards, BR1 10—12. Front tibia without terminal scale but with a short spur and truncate end (Fig. 2-G). Terminal combs of middle and hind tibiae short and almost contiguous, without long spur but occasionally with a short spur (Fig. 2-H). Each leg has an empodium, a pair of simple claws, and a pair of small pulvilli (Figs. 1-D, E).

Male hypopygium in Figs. 2-A, B. Anal point (Fig. 2-C) shorter and stouter than in *Micropsectra chuzeprima,* parallel sided and with rounded apex. Anal tergite bands separated in the middle. Appendage 1 thumb-like, with 12 short setae on the dorsal surface, 2 long setae on the inner margin, numerous microtrichiae on the inner half of both dorsal and ventral surfaces, and one stout seta on the ventral side near the base; appendage 1-a finger-like and extends slightly beyond the inner margin of appendage 1 (Figs. 2-D,E). Appendage 2 (Fig. 2-F) relatively long, reaching beyond middle of gonostylus, apical half slightly expanded and bear about 30 long and recurved hairs; appendage 2-a shorter than in *M. chuzeprima,* with numerous simple hairs from the base to near the tip, and several spoonshaped setae on the apical portion (Fig. 2-F). Gonostylus 1.14—1.32 times the length of gonocoxite, with about 13 long setae along the inner margin (Fig. 2-A).

Female. Body length 4.57-5.83 mm (5.11mm in average of 3), wing length 3.13—4.13mm (3.49mm). Body almost uniformly black, as in male. Head in Fig. 1-H. Eyes with a dorsomedial projection, ER 0.40—0.56 (0.48). Antenna with 5 flagellar segments, last segment with two subapical setae 128 and 100 microns long. Palp composed of 4 segments, 52, 188, 152, 176 microns long. Frontal tubercles small, 12 microns high, 10 microns wide, and 70 microns apart from each other (Fig. 1-J). Supraorbital setae 14—22, clypeal setae 28—34. Antepronotum without lateral setae. Dorsomedian setae 16—18, dorsolateral setae 15—20, pre-alar setae 2, 3 or 4. Scutellum with 12 17 setae in double rows. Wing in Fig. 1-I, more hairy than in male, fCu slightly proximal to r-m. Front tarsus I slightly shorter than front tibia, LR1 0.95 -0.96 (unusually small as a member of Chironominae); LR2 0.49—0.50, LR3 0.54—0.59. Front tarsus V 0.19—0.20 times as long as front tibia. Tarsi with relatively long beards as a female, BR1 3.3—3.5, BR2 4.6—4.8, BR3 5.2—6.5. All legs with a pair of simple claws, an empodium, and medium sized pulvilli. Spermathecae two, both oval, about 90 microns long and 70 microns wide (Figs. 1—K,L). Cercus longer than wide, with pointed apex, 170 microns long and 130 microns wide (Fig. 1-M).

Pupa. A pupal skin cast of *Micropsectra* (not associated with adult) was discovered among samples collected from water suface of the Lake Yunoko on 28 April 1979. Length of abdomen 6.43 mm. Thoracic respiratory organs typical of this genus, i.e. tube-like and tapering towards tip, 0.56—0.58 mm long and 0.10 mm wide, and with numerous long and rigid hairs, as in Fig. 3-A. Distribution of spines and spinules on abdominal tergites in Fig. 3-B, C. Abdominal segment I without spines and spinules. Tergite II with a pair of large central spinose areas, and an uniserial transverse row of 225 large recurved spines each about 22 microns long on the intersegmental membrane (Fig. 3-D,IId). Tergite III with a pair of proximal spinose areas, and a pair of spine patches 240 microns long and 60 microns wide, composed of more than 100 long and sharply pointed spines, each about 45 microns long (Fig. 3-D, IIIc). Tergite IV with a pair of proximal spine patches 185 microns wide and 120 microns long, composed of short and stout spines each about 30 microns long (Fig. 3-D,IVa), and a pair of central spinose areas. Tergite V also has a pair of proximal spine patches similar in structure to those of tergite IV but slightly smaller, and a pair of central spinose areas. Tergite VI with a pair of longitudinal spinose areas. Tergites VII and VIII with a pair of small proximal spinulous areas. Caudolateral scales of tergite VIII bear 7—8 strong spurs along the caudal margin (Fig. 3-I). Anal segment (Fig. 3-C) with a pair of anal fins each bearing a long filamentous hair near inner margin and 73 or 75 long filamentous fringe hairs, and a pair of conical genital sheaths. Abdominal segments II to V with 3 pairs, VI and VII with 4 pairs and VIII with 5 pairs of lateral setae, among which those on II and III, and the middle pair of IV are short and flat, and all the others are long and flat hairs.

Remarks. By the structure of male hypopygium and tibial combs the present species is regarded as belonging to the *notescens* group of genus *Micropsectra* Kieffer as defined by Saewedal (1976). Among the previously known species of this group, it is closest to *M. montana* Saewedal 1976 in the structure of male hypopygium. The latter was described with a single male collected in Katmandu, Nepal, from which antenna and tarsi are lost and thus the values of AR and LR are unknown, but the present species is almost undoubtedly different from it since the latter is pale yellowish in body coloration. Comparison of the present species with previously known

Japanese *Micropsectra* will be given later. The body coloration entirely black, being entirely black, extremely high values of AR and BRl as well as low value of LRl are characteristic to this species.

(2) *Micropsectra chuzeprima,* sp. nov.

Materials studied. 2 males and 4 females emerged from bottom sample A collected at the depth of 28 meters of Lake Chuzenji on April 28, 1979. Holotype: emerged 12 May 1979 (No. A 36:71). Paratypes: a male emerged 14 May, first fixed on pin for observation of body coloration, and later mounted on slide (No. A 36:73); a female mounted on slide together with associated pupal and larval skin (No. A 36:75). 2 male and 4 female pupal skins associated with adults (Nos. A 36:70, 72,74−77). 4 larvae collected from the same bottom sample (Nos. A 36:78, 79). A male and a female was collected also with insect nets on the shore of Lake Chuzenji on 8 May 1981 (Nos. 51:19, 20).

Male. Body length 5.25−5.75 mm, wing length 2.97—3.16mm. Antennal hairs and shaft dark brown, ground color of scutum brown, scutal stripes and postnotum dark brown, scutellum brownish yellow, halteres pale yellow, wing unmarked, abdominal tergites I to V brown, VI to IX dark and hypopygium brown, leg segments almost uniformly brown.

Antena with 13 flagellar segments, AR 1.34—1.54. Palp 4 segmented. Frontal tubercles absent. Eyes with a long dorsomedial projection, ER 0.36—0.47. Supra-orbital setae 15—16 on each side. Clypeal setae 18 −20. Antepronotum without setae. Scutum with 10 dorsomedians, 10 12 dorsolaterals and 2 or 3 pre-alars. Scutellum with 8—10 setae in uniserial transverse row. Wing mambrane slightly purplish brown under transmitted light, with numerous macrotrichiae. Squama bare. Anal lobe rather flat. Wing venation in Fig. 4-A. r-m short and parallel to the wing axis. fCu and r-m on alomst the same level. R 2 + 3 ending close to R 1. Leg segments almost uniformly brown. LR1 1.52—1.54; LR2 0.54—0.57; LR3 0.72 −0. 74. Front tarsus V 0.25—0.27 times as long as front tibia. Front tibia with a narrow and sharply pointed terminal spur about 15 microns long (Fig. 4-D). Terminal combs of middle and hind tibiae fused with each other, low and surrounding more than 2/3 of circumference of tibia, and without spur (Fig. 4-E). Tarsi with beards of moderate lengths, BRl 4.0—4.2. Pulvilli moderate in size (Fig. 4-F).

Hypopygium in Figs. 5-A, B. Anal point (34 microns long), narrow and nearly parallel sided, with a rather pointed apex. Ninth tergite with 5 relatively short hairs and numerous microtrichiae (Fig.5-C). Bands of ninth tergite widely separated in the middle (Fig. 5-A). Appendage 1 thumb-like, with 7 short hairs on the distal portion, and a basal spur 17 microns long arising from a prominent triangular base (Figs. 5-D, E). Appendage 1-a 80 microns long, knife-shaped and with rounded apex, completely hidden behind appendage 1 when seen from dorsal aspect (Fig. 5-E). Appendage 2 (Fig. 5-F) 136 microns long and 28 microns wide, apically rounded and not expanded, with some 20 long hairs from near the apex. Appendage 2-a 90 microns long and 15 microns wide, nearly cylindrical, bearing numerous hairs which are narrow and simple on the basal half but those arising from the apical portion are spoon-like (Fig. 5-F). Gonostylus in Figs. 5-A, B, outer margin only slightly convex and almost parallel to the inner margin, with obliquely truncate apex.

Female. Body length 3.95—5.00 mm in the gum-chloral mounted specimens. Wing length 2.52 3.46mm (2.96mm in average). Body coloration as in male, mostly dark brown. Pronotum and scutum strongly produced forwards, covering most of the head when seen from above. Antenna 6 segmented (79, 88, 76, 98, 107. 174 microns), the last segment with a subapical hair 88 microns long (Fig. 4-C). Palp 4 segmented (50, 167, 145, 219 microns, Fig. 4-B). Frontal tubercles absent.

Wing membrane milky white, slightly purplish brown when seen by transmitted light, with numerous macrotrichiae. Wing venation in Fig. 4-A. Legs almost uniformly brown. LR1 1.47—1.58. Pulvilli moderately developed. Cercus and spermathecae in Figs. 4-G, H.

Pupa. Length of abdomen 5.00—5.31mm (males) and 4.40—4.79mm (4 females). Thoracic respiratory organs (Fig. 4—I) 0.80—0.88mm long, tube—like, tapering towards apex and with numerous fine hairs. Distribution of spines and spinules on abdominal segments as follows (Fig. 6-A). Segment I without spines and spinules. Tergite II with a central longitudinal zone of small spines, and a transverse uniserial row of large recurved spines on the intersegmental membrane (the number of spines: 85—121; 103.0 in average of 6) ; sternite II with a proximal spinulous area. Tergite III with a central longitudinal zone of small spines, and a pair of long spine-groups distally (the longest spine about 80 microns, Fig. 6-D). Tergite IV and V with a pair of short and stout spine-groups proximally, and a pair of longitudinal spinose areas distally (Figs. 6-E,F). Tergite VI with a pair of central longitudinal spinose areas but devoid of long or stout spines. Tergite VII without spines and spinules. Tergite VIII with a pair of small spinulous areas proximally, and a pair of caudolateral scales (Figs. 6-I,J) bearing 5—6 terminal spines in a transverse row. Segment II and III with 3 pairs of short and flat lateral hairs; segments IV and V with 3 pairs, segments VI and VII with 4 paris, and segment VIII with 5 pairs of long and flat lateral hairs (Fig. 6-H). Anal fins each fringe with numerous long and flat filamentous hairs, and bear one long and flat hair near the inner margin (Fig. 6-B); the numbers of fringe hairs on anal fins in 3 pupal specimens are 100,104; 76,74; 87,84.

Larva. (A single specimen collected from the bottom sediment of Sample A has the following morphological characters). Body length 6.4mm Color in life pink. Base of antenna roughly cylindrical, 140 microns high and 67 microns in diameter, with a terminal tubercle roughly triangular in shape, 19 microns high and 22 microns wide at the base (Fig. 7-A). Antenna 5 segmented (240,80,29,10,7 microns, Fig. 7-A); segment I slightly curved, with a ring organ at the base and a hair (68 microns long) at 2/3 from base, and a terminal blade 70 microns long ; segment II asynmetrically expanded apically; segments III, IV and V very narrow and short; Lauterborn's organs situated on a pair of long petioles each 150 microns long. Labial plate 164 microns wide, with 11 teeth, the central tooth highest and widest, about twice as wide as the first lateral pair, and somewhat paler than the lateral teeth. Paralabial plates each 133 microns wide and 34 microns long, almost touching in the middle and only 8 microns apart from each other (Fig. 7-C). Mandible 207 microns long and 176 microns wide, with 5 cutting teeth, subapical comb and mandibular brush; accessory tooth elongate, 85 microns long and reach beyond the tip of mandiblular teeth (Fig. 7-D). Premandible, labrum and maxilla in Figs. 7-F, E, B. Anterior pseudopods well developed, claws (Fig. 7-G) simple, slightly serrated. Abdominal segments II to VI with a pair of bifid hairs on the caudolateral corners. Preanal hair tuft (Fig. 7-I) composed of 8 long and two short hairs on each side aising from semiglobular

base. Blood gills absent on 8th abdominal segment. Anal gills short and triangular (Fig. 7-H). Posterior pseudopods each with about 90 small claws (Fig. 7-J).

Remarks. This species is ecologically interesting in that all the specimens were recovered from a profundal zone at the depth of 28 m of Lake Chuzenji, and not from the shallower littoral zones. It also seems to belong to the *notescens* group of *Micropsectra,* and closest to *M. insignilobus* (Kieffer) in the structure of male hypopygium and values of AR and LR, but again differs from the latter in the shape of anal point (very narrow and parallel-sided in the present species, short and acutely triangular in the latter), in the length of appendage 1-a (long and reaching beyond margin of appendage 1 in the latter), in the absence of frontal tubercles (present in the latter), and the length of appendage 2-a about 90 microns in the present species, at most 57 microns in the latter). Comparison of the present species with previously reported species of this genus from Japan will be discussed later.

(3) *Micropsectra chuzenotescens,* sp. nov.

Materials studied. 4 males and 4 associated pupal skins obtained from sample B # 10 collected 8 May 1981 from a small stream on the shore of Lake Chuzenji. A female of presumably the same species emerged from the same sample (Specimens No. A 51: 16 18).

Male. Body length 3.85 3.90mm (3.87mm in average of 3), wing length 1.93 − 2.28mm (2.10mm), wing length remarkably smaller than about 3.0mm of *M. chuzeprima.* Body coloration largely yellowish brown, generally paler than *M. chuzeprima;* ground color of scutum yellow, scutal stripes brown, scutellum yellowish brown, postnotum brown, abdominal tergites yellowish brown; femora and tibiae largely brown, tarsi yellowish brown.

Head in Fig. 8-B. Eyes with a conspicuous dorsomedial projection, ER 0.38—0.47 (0.42). Antenna with 13 flagellar segments, AR 1.04-1.16 (1.11), smaller than *M. chuzeprima.* Antennal hairs long, AHR 0.51 −0.54. Frontal tubercles absent. Palp 4 segmented, 52, 132, 135, 196 microns. Supraorbital setae 12—14 in a single row. Clypeal setae 18 −24 (20.0). Antepronotum without setae. Scutum with 12 —16 dorsomedian setae, 8—10 dorsolateral setae, and 2, 3 or 4 pre-alar setae on one side. Scutellar setae 6 or 8 in a single row. Wing in Fig. 8-A. Wing membrane slightly purplish, and with macrotrichiae on almost the entire surface including the besal portion. Squama bare, anal lobe rather flat. R 1 and R 4+5 running close together, R 2+3 almost fused with R 1. Costa not extending beyond end of R 4 + 5. fCu much beyond r-m. LR1 1.41—1.52 (1.48), LR2 0.57—0.60 (0.59), LR3 0.69—0.73 (0.71). Front tibia with a short and sharply pointed terminal scale (Fig. 8-F). Terminal combs of middle and hind tibiae contiguous and without spurs (Fig. 8-G). Tarsi with medium sized beards, BR1 4.0—4.3, BR2 5.3—6.2, BR3 5.9—6.6. Tarsi V with an empodium, a pair of claws, and medium sized pulvilli (Fig. 8-H).

Hypopygium in Figs. 9-A,B. Ninth tergite without tubercles on posterior margin such as seen in *M. chuzelonga,* and with several setae in the middle and near posterior margin. Anal point short, relatively narrow, widest at base and tapering towards apex and with rounded apex. Anal point crests well developed. Dorsal appendages (Figs. 9-C,D) thumb-like, without microtrichiae on dorsal side, smoothly rounded apically (not angulated as in *M. chuzeprima*), with 7 short setae on dorsal side

along posterior margin and a strong seta at base (Fig. 9-C). Appendage 1-a finger-like, slightly curved inwards and with rounded apex, attached on the ventral side of appendage 1 and not extending beyond the inner margin (Fig. 9-D). Appendage 2 expanded apically like a bulb, with some 13 recurved setae on dorsal side and 6 caudally directed setae on ventral side of the apical portion (Figs. 9-B,E). Appendage 2-a rather short, the shaft extending to only about middle of appendage 2 and apically expanded, with simple setae on basal portion and spoon-like setae on apical portion (Fig. 9-E). Gonostylus long, slender and almost parallel-sided, obliquely truncate apically and with pointed apex like in *M. chuzeprima* (Fig. 9-A,B).

Female. A female of presumably belonging to the same species as the above males was recovered on the same day from the same sample (Specimen No. A 51:17 b). Body length 3.20mm, wing length 2.20mm (similar to that of males and smaller than females of coexisting *M. chuzeprima*). Body coloration largely yellowish brown as in male. Head in Fig. 8-C. Eyes with a dorsomedial projection, ER 0.43. Frontal tubercles absent. Antenna with 5 flagellar segments, last segment with a long apical seta. Palp 4 segmented, 60, 165, 160, 248 microns. Supraorbital setae 13 on one side, clypeal setae 32. Scutum with 16 dorsomedial setae, 18 and 20 dorsolateral setae, 3 and 4 pre-alar setae. Scutellar setae 8 in a row. LR1 1.56, LR2 0.64, LR3 0.69. BR1 3.5,BR2 4.1,BR3 6.5. Spermathecae two, both small, 60 × 41 microns, 62 × 34 microns (Fig. 8-J). Cercus small, with slightly angulate posterior margin, 82 microns long and 108 microns wide (Fig. 8-I).

Pupa. Length of abdomen 3.36 -3.75 mm (3.56mm in average of 4). Abdomen of pupal exuviae almost colorless, spinose areas on tergites III, IV and V only slightly pigmented. Shaft of thoracic horns tube-like, tapering towards apex and clearly visible, 344-376 microns long (360 microns in average of 4 pairs), with numerous long setae (fewer in numbers than in *M. chuzelonga;* Figs, 9-F,G). Distribution of spines, spinules and setae on abdominal tergites in Figs. 10-A,B. Tergite I without spines. II with a large central spinose area composed of all small spines, a, b and c confluent, and a transverse uniserial row of small recurved spines along candal margin (II-d), each spine about 14 microns long, the number of spines 89-134 (102.8 in average of 4; Fig. 10-C). Tergite III with a large central spinose area, the laterl spines being minute, and those composing a pair of longitudinal rows being very long, narrow and sharply pointed (Fig. 10-D). Tergite IV with a pair of proximal spinose areas (IV-a) and a pair of longitudinal rows of long spines continuous to them (a characteristic of this species; Fig. 10-E). Tergite V also with a pair of proximal spinose areas and a longitudinal row of small spines continuous to them (Fig. 10-F). Spinose areas on tergite VI are similar in shape but the spines are all much smaller (Fig. 10-G). Tergites VII and VIII with spinulous areas but without spine patches. Caudolateral scales of segment VIII small, palmate, with 3—6 (most frequently 5) sharply pointed and pigmented spines (Fig. 10-H). Segments II to VI with 3 pairs, VII with 4 pairs and VIII with 5 pairs of lateral hairs, among which all of those on II and III as well as the middle pair on IV are short and simple, while the rests are all long, flat and filamentous. Anal fins each with a long, flat and filamentous hairs near lateral margin, and 28-38 (32.3 in average of 4 pairs) long, filamentous fringe hairs.

Remarks. This species is very closely related in the morphology of adult male to *Micropsectra notescens* (Walker, 1856) of Europe which was redescribed in details by Saewedal (1976), especially in that appendage 2-a being short and with spoon-shaped lamellar setae at tip, anal point crest well developed, and appendage 2 with tip

forming a swelling. However, the present species seems to differ from *notescens* in that body coloration being generally paler (largely dark brown in *notescens*), AR smaller (1.21—1.68 in *notescens*), frontal tubercles absent (present in *notescens*), and in the shape of gonostylus (obliquely truncate in the present species, smoothly tapering towards apex in *notescens*), and appendage 1-a shorter (extending beyond margin of appendage 1 in *notescens*). The pupa is also closely related to that of *notescens* in general morphology, and in that middle pair of lateral setae of abdominal segment IV are short and simple, while the anterior and posterior pairs are long and flat (LsL-type), but differs from pupa of *notescens* in Figs. 15 and 19 of Saewedal (1976) in that lateral hairs on segment VI are 3 pairs in the present species (4 pairs in *notescens*), and segment IV has a pair of longitudinal rows of long spines as in Fig. 10-E in the present species (they are all composed of small spines in *notescens*).

(4) *Micropsectra chuzelonga*, sp. nov.

Materials studied. 3 males emerged from a sample collected 8 May 1981 from a small stream on the shore of Lake Chuzenji, Station No. B. 10. (Specimens No. A 51: 11—13); 3 pupal exuviae mounted on a slide (No. A 51:14).

Male. Body length 3.43, 3.60, 3.16mm, wing length 2.23, 2.16, 2.26mm. Body coloration largely brown; ground color of scutum yellow, stripes brown, scutellum yellow, postnotum brown, halteres yellow, wing unmarked; leg segments almost uniformly brown; abdominal tergites brownish yellow.

Head in Fig. 12-A. Small frontal tubercles present, about 6 microns long and 6 microns in diameter, 55 microns apart from each other (Fig. 12-B). Eyes bare, with a long dorsomedial projection, ER 0.27, 0.34, 0.38. Supraorbital setae 18, 15, 14 on each side. Clypeal setae 14, 15, 18. Antenna composed of a pedicel and 13 flagellar segments, AR 1.49, 1.50, 1.39. Palp 4 segmented as usual, 72, 120, 192, 336 microns. Antepronotum without lateral setae. Scutum with 25, 16, 22 dorsomedian setae, (12, 11), (10, 11), (8, 10) dorsolateral setae, and (3, 3), (4, 5), (2, 2) prealar setae, Scutellar setae all 10 in a single row (Fig.12-C). Wing unmarked, with numerous macrotrichiae on almost entire surface. Squama bare. Anal lobe rather flat.

R 1 and R 4+5 running close together, R 2+3 almost fused with R 1. Costa not extending beyond end of R 4+5. r-m parallel to R 4+5. fCu slightly beyond r-m. Tip of front tibia with a small terminal spur (Fig. 11-F). Terminal combs of middle and hind tibiae (Fig. 11-G) fused with each other and without spur. LR1 1.72, 1.67, 1.66; LR2 0.58, 0.60, 0.60; LR3 0.72, 0.74, 0.73. Tarsus V of front leg 0.25 or 0.26 times the lenght of front tibia. Tarsi with relatively long beards, BR1 4.5, 3.7; BR2 7.8, 5.7, 6.3; BR3 6.8, 5.6. Pulvilli rather small, claws simple (Fig. 11-H).

Hypopygium in Figs. 11-B,C. Anal point with a broad base and rounded apex, crest well developed and overlapping each other. Band of ninth tergite separated. Ninth tergite with a pair of small, conical tubercles on posterior margin. Appendage 1 thumb-like, posterior margin smoothly rounded, with several dorsal setae (Fig. 11-D). Appendage 1-a long, knife-like, extending much beyond inner margin of appendage 1 (Fig. 11-C). Appendage 2 long, slightly expanded apically, with some 12 recurved setae on the dorsal side, and 6 caudally directed setae on the ventral side of the apical portion. Appendage 2-a very long and slender, with simple

setae arising from the shaft, and spoon-shaped setae arising from the apical portion. Gonostylus in Fig. 11-B.

Pupa. Length of abdomen 3.25—3.60mm in measurements of 3 specimens. The shaft of thoracic respiratory organs transparent and almost invisible (a characteristic of pupa of this species), though they bear numerous long, straight and rigid hairs as in Fig. 12-D. Distribution of spines, spinules and hairs on abdominal tergites in Figs. 13-A,B. Tergite II with a large spinose area of small spines continuous from the proximal to caudal parts (II-a,b,c), and a caudal row of large, recurved spines, 83—126 in numbers (Fig. 13-C). Tergite III with a transverse band of proximal spinose area, and a pair of longitudinal rows of spines contiguous to it, some of which are long, narrow and sharply pointed (Fig. 12-E). Lateral hairs on abdominal segments are 3 pairs on II to V, 4 pairs on VI and VII, and 5 pairs on VIII, among which all of those on II and III and the middle pair on IV are short and simple, while the rests are long, flat and filamentous. Caudolateral scales on segment VIII with 7-18 spines. Anal fins with a pair of long, filamentous hairs on the dorsal side, and 39-52 fringe hairs.

Remarks. This species seems to belongs also to the *notescens* group of Saewedal (1976), since it is a relatively large species with wing length over 2mm, appendage 1 is finger-like, 1-a present, 2 with nearly parallel margins, 2-a with spoon-shaped setae at tip, and anal point crests are well developed. Among species of this group known from Europe, it seems to be most closely related to *apposita* (Walker, 1856) in the structure of appendage 2-a, but anal point is much wider and 1-a much longer in the present specis, and *apposita* has no lateral tubercles on ninth tergite (Fig. 175 C of Pinder, 1978). Among 9 species of *Micropsectra* so far recorded from Japan, the present species is most closely related to *fossarum* of Tokunaga (1938) in that AR being about 1.3, ninth tergite with a pair of conical tubercles, appendage 1-a long and exceeding inner margin of appendage 1, 2-a long and with spoon-like seta. However, in *fossarum* the shape of anal point is narrow and sharply pointed, legs without beards, hind margin of appendage 1 triangular (rounded smoothly in the present species), appendage 1-a being curved, tapering towards apex and apically pointed (it is straight, parallel-sided and with rounded apex in the present species), and spoon-like seta on appendage 2-a arise from apical 1/3 of the shaft (they arise restricted to apical 1/8 of the shaft of appendage 2-a in the present species). *M. fossarum* was collected from stagnant water in Kyoto, while the present specimens were found in clean running water in the high mountain area.

The four species of *Micropsectra* collected from the Nikko area, i. e. (1) *yunoprima,* (2) *chuzeprima,* (3) *chuzenotescens,* and (4) *chuzelonga,* can be differentiated in male adult by that body coloration is shining black in (1) but brown or yellowish brown in the others, the body size as measured by wing length in mm being by the order of (1) 3.74—4.07, (2) 2.97—3.16, (3) 2.16—2.26, and (4) 1.93—2.28, by the presence in (1) and (4) but the absence in (2) and (3) of frontal tubercles, by values of AR being 2.72—3.15 in (1), 1.34—1.48 in (2), 1.04—1.16 in (3), and 1.39—1.50 in (4), by front leg ratio (LR1) being as low as 1.03—1.08 in (1) but larger in the others, 1.41—1.54 in (2), 1.41—1.52 in (3), and 1.66—1.72 in (4), by the very long tarsal beards of BR1 10—11 in (1) and 3.6—6.7 in the other species, by the presence of lateral tubercles on posterior margin of ninth tergite in (4) and absence in the others, by the shape of anal point [very narrow and apically pointed in (2) and (3), wider and parallel-sided and with rounded apex in (1), widest at base and triangular in (4)], by

the characteristic shape of appendage 1 in each species, by the relative length of appendage 1-a [long and extending beyond margin of appendage 1 in (1) and (4), shorter and not extending beyond the margin in (2) and (3)], by the shape of appendage 2 [*apically expanded in (3) only*], by the length and structure of appendage 2-a [very long in (4) and very short in (1) and (3)], and in the shape of gonostylus [obliquely truncate in (2) and (3), smoothly tapering in (1) and (4)].

In pupa, they also differ in the length of abdomen corresponding to the size of adult, in the size and relative length of hairs on thoracic respiratory organs, in the structure of spinose areas on abdominal tergite IV (the proximal spine patches and the lateral longitudinal spine patches are separated and the latter being composed of small spines in (2), both are contiguous in the others, the latter with long spines in (3) and (4) but with only small spines in (1)], in the color of proximal spinose patches on segments IV and V (dark brown in (1) and (4) but almost colorless in (2) and (3)], in the structure of middle pair of lateral setae on segment IV [long, flat and filamentous as in the first and third pairs in (2) but short and simple in the others], in the number of lateral hairs on segment VI [3 in (3) and 4 in the others] , and in the numbers of fringe hairs on anal fins [84-104 in (2), 73—75 in (1), 39—52 in (4), 29—38 in (3)].

A key to males of Japanese *Micropsectra*

Altogether 11 species belonging to genus *Micropsectra* have been reported from Japan, including 4 new ones described in the present paper. These can be differentiated in male by the following key.

1- Large species with body length 5.0—5.5 mm and wing length 3.74—4.07mm; body entirely black; AR high, 2.7－3.2; LR low, 1.0－1.1; tarsi with extremely long beards, BR 10—12 ····· *yunoprima, sp. nov.*

- Body length less than 4.5 mm, or wing length 3.5mm or less; color dark brown, brown or greenish yellow; AR 1.5 or less; LR 1.4 or higher; BR1 6.6 or less 2

2- Body greenish yellow or whitish yellow; AR 1.2 or less ····· 3

- Body brown or dark brown ····· 5

3- Small species with body length about 2.8 mm and wing length 1.64—1.67 mm; AR small, about 0.9; LR1 high, about 2.1; appendage 1-a long, extending beyond margin of appendage 1; with a pair of small tubercles on posterior margin of ninth tergite. ····· *tamaprima* Sasa, 1980,p.11

- Larger species with body length 3.3mm or longer; AR 1.0—1.2; LR1 1.73 or less; appendage 1-a shorter, not extending beyond margin of appendage 1; (ninth tergite probably without lateral tubercles) ····· 4

4- Anal point almost parallel-sided and with rounded apex; AR 1.0; LR 1.6 1.7; body length 3.3—3.4 mm; scutum yellow, scutal stripes abscure.
····· *daisenensis* Tokunaga 1938,p.364

- Anal point triangular, widest at base and apically pointed; AR 1.1—1.2; body length 3.8 mm; scutal stripes yellowish and separated; hypopygium closely resembling *praecox* Meigen. ····· *subviridis* Goetghebuer of Tokunaga, 1940,p.306 (*subviridis* G. is regarded as a synonym of *junci* Meigen and redescribed by Saewedal 1976)

5- Wing with macrotrichiae only on apical 1/3; body length 4.5 mm, wing length 3.5 mm; with small frontal tubercles; AR 1.4; anal point short, stout and triangular; appendage 1 very broad, 1-a extending beyond margin of appendage 1 and apically pointed; appendage 2-a long, slender and extending beyond appendage 1. ····· *taiwanus* Tokunaga, 1939,p.336

- Wing with macrotrichiae on almost entire surface ····· 6

6- Appendage 1-a absent; body length 3.6 mm; AR 0.81; LR1 1.63; anal point small, excavated dorsally on basal part; appendage 1 subtriangular, broad and pubescent basally, beaklike and bare apically (Plate 4,Fig. 84).
····· *shinaensis* Tokunaga, 1940,p.306

- Appendage 1 present; AR 1.0 or larger ····· 7

7- Ninth tergite with a pair of small setigerous tubercles on posterior margin; anal point broadest at base and apically pointed; appendage 1-a long, extending far beyond margin of appendage 1; frontal tubercles present ····· 8

- Ninth tergite without tubercles on posterior margin; anal point very narrow and almost parallel-sided; appendage 1-a short, not extending beyond margin of appendage 1; frontal tubercles absent ····· 9

8- Appendage 1 thumb-like, smoothly rounded apically; appendage 1-a straight, parallel-sided and rounded apically; spoon-like setae of appendage 2-a arise from apical 1/8 of the shaft; anal point broader at base. ····· *chuzelonga*, sp. nov.
- Appendage 1 tapering towards apex; 1-a curved, tapering towards apex; spoon-like setae of appendage 2-a arise from apical 1/3 of shaft; anal point narrower at base ····· *fossarum* Tokunaga, 1938, p.362

9- Larger species with wing length 2.97—3.16mm; AR 1.34—1.48; appendage 1 triangularly pointed apically; appendage 2 not expanded apically; body dark brown. ····· *chuzeprima*. sp. nov
- Smaller species with wing length 1.93—2.18 mm; AR 1.04—1.16; appendage 1 thumb-like and apically rounded; appendage 2 apically swollen like a ball ····· *chuzenotescens*, sp. nov.

Note: In addition, a species was reported by Tokunaga (1940,p.305) by the name of *Tanytarsus (Micropsectra) praecox* Meigen from Mount Hiei, Kyoto, without giving figures. It has body length 4 to 4.5mm, AR about 1, LR1 about 1.75. *Chironomus praecox* Wiedemann in Meigen, 1818 as well as *Tanytarsus (Micropsectra) subviridis* Goetghebuer 1921 of Edwards (1929) was regarded as synonyms of *Micropsectra junci*, (Meigen, 1818) by Saewedal (1976). *M. junci*, as redescribed by Saewedal (1976,p. 131), differs from the above Japanese species in that appendage 2 with a transverse ridge.

(5) *Tanytarsus yunosecundus*, sp. nov.

Materials studied. 4 males and 4 females emerged from a sample collected from bottom of Lake Yunoko 27 April 1979. 3 pupal exuviae associated with the males were also mounted on slides (No. A 36:51—58).

Male. In two gum-chloral mounted specimens, body length 3.26 and 3.58 mm, wing length 2.07 and 2.18 mm. Body coloration largely greenish yellow.

Antenna 14 segmented, AR 1.09 and 1.20. Palp 4 segmented (43, 124, 133, 217 microns). Frontal tubercles 24 microns long and 12 microns in diameter, setigerous (Fig. 14-D). Eyes 245 microns apart from each other, 240 microns high, ER 1.02, dorsomedial projection rather small. Supraorbital setae 10 on each side, clypeal setae 10.

Ground color of scutum greenish yellow, scutal stripes yellowish brown, scutellum greenish yellow, postnotum yellowish brown, halteres yellow. Wings slightly brown under transmitted light, wing membrane with macrotrichiae sparsely distributed (Fig. 14-A). Squama bare. Wing venation as in Fig. 14-A. fCu distal of r-m. Legs brownish yellow, without pale or dark bands. LR1 2.38, 2.43. Longest hairs on front tarsus I about 75 microns long and 3.5 times the diameter of the segment. Femora, tibiae and tarsi I of middle and hind legs with long hairs. Terminal scale of front tibia narrow and sharply pointed (Fig. 14-A). Terminal comb scales of middle and hind tibiae widely separated from each other, each with a longish spur (Fig. 14-G). Pulvilli moderately developed.

Abdomen almost uniformly greenish yellow, without transverse bands. Hypopygium as in Figs. 15-D, E. Bands of 9th tergite separated in the middle.

Anal point (Fig. 15-F) with microtrichiae in the basal part, otherwise bare, with 4 spine groups, and about 4 lateral hairs. Appendage 1 (Fig. 15-A) 45 microns long and 21 microns wide, with smooth surface, roughly oval but slightly concave along the inner margin, with 3 setae on inner margin and 8 setae on outer margin. Appendage 1-a horn-like, 36 microns long, curved apically, and reach a little beyond the posterior end of appendage 1 (Fig. 15-H). Appendage 2 (Fig. 15-B) slightly expanded apically, with 12 recurved setae. Appendage 2-a (Figs. 15-D,E,G) 120 microns long and reach far beyond tip of appendage 2,and bears numerous long and fine setae along inner margin. Inner margin of gonocoxite at base of appendage 2-a expanded medially to form a rectangular lobe (Fig. 15-E,). Gonostylus widest at about basal one third, with pointed apex (Fig. 15-C).

Female. Body length in two gum-chloral mounted specimens 3.21 and 4.04mm. Wing length 1.67 -1.90mm (1.80 ±0.08 mm in measurents of 4). Body coloration similar to the male. Ground color of scutum yellow, scutal stripes brown, abdomen yellowish green, legs yellowish brown. Antenna 5 segmented (67, 129, 88, 86, 160 microns' Fig. 14-C), second segment with double rows of hairs, last segment with a subapical sata 87 microns long. Palp 4 segmented (50, 128, 133, 248 microns, Fig. 14-B). Frontal tubercles conical, 26 microns high and 36 microns wide at the base (Fig. 14-E). Wing venation in Fig. 14-A. Macrotrichiae more extensively and densely distributed on the wing membrance than in male. Leg ratio 1.67 1.90 (1.80+0.08 in measurements of 4), smaller than in male. Pulvilli well developed (Fig. 14-1). Cercus and spermathecae in Figs. 14-J, K.

Pupa. Thoracic respiratory organs (Fig. 16-A) tube-like, 0.36—0.59 mm long and 0.03 0.04mm wide (0.51 mm, 0.035 mm, in average of 4), apically tapering to a sharp point, thin membranous and without minute hairs such as seen in *Tanytarsus chuzesecundus* (Fig. 20-A). Distribution of spines and spinules on abdminal segments in Fig. 16-A. Both sternite and tergite I with a proximal spinulous area. Tergite II with a pair of spinose areas extending from proximal 1/5 to near caudal margin of the segment, separated along the median line and narrowed in the middle, and an uniserial row of 52 or 56 large recurved spines along the caudal margin. Tergites III to VI each with a pair of spine-groups, which are comb-like in segments III and IV, and pine-apple shaped in segments V and VI (Figs. 16-D, E, F, G, H). Tergite VIII with a pair of Proximal spinulous areas, and a pair of caudolateral scales characteristic to this species (Fig. 16-H). Lateral hairs are 3 pairs on segments II to VI, 4 pairs of segment VII, and 5 pairs on segment VIII, among which the caudal two pairs of segment VII and all 5 pairs on segment VIII are the long flat swimming hairs, while the rests are short and narrow bristles. The caudal segment has a proximal spinose area, a pair of genital sheaths and anal fins, each of which bear 30—32 long and filamentous fringe hairs, and two dorsal swimming hairs (Fig. 16-I). Caudolateral scales on abdominal segment VIII with about 7 long marginal spines and several short spines on the ventral surface (Figs. 16-H,J).

Larva. Body length 9.8mm (single specimen mounted in gum-chloral). Color in life pink. Head 0.43 mm long and 0.36 mm wide. Antennal tubercle 113 microns high and 72 microns wide. Antenna 5 segmented (167, 41, 19,12, 5 microns), total length 245 microns and 1.6 times the length of mandible; segment I 2.17 times the combined length of segments II to V, slightly curved, with a ring organ near the base, a hair (63 microns long) arising from slightly beyond the middle, and a blade (43 microns long) from the tip; Lauterborn's organs with a long petiole each 110 microns

long (Fig. 17-C). Labial plate (Fig. 17-A) 100 microns wide, anterior margin only slightly convex, with 9 rather flat teeth, the central tooth widest, about 3 times as wide as the first lateral teeth. Paralabial plates each 130 microns wide and 27 microns long, almost touching in the middle and only 4 microns apart from each other. Mandible 150 microns long and 72 microns wide, with 5 rather flat cutting teeth, with a preapical comb composed of 17 22 stout and curved hairs, a long accessory tooth reaching slightly beyond tip of mandible, and a basal brush composed of 4 tree-like hairs. Labrum, Fig. 17-E; premandible, Fig. 17-D; maxilla, Fig. 17-E. Preanal hair tuft composed of 8 long stout hairs and 2 short hairs, the base being rather flat (Fig. 17-H). Posterior pseudopods with 15 claws (Fig. 17-I). Anal gills short, blood gills absent.

Remarks. This species obviously belongs to the *Tanytarsus lestagei* aggregate of Fittkau and Reiss (1971, p.107), since the male has several spine clusters and microtrichiae on anal point, extremely long appendage 2-a with the distal setae extending far beyond tip of appendage 2, and a triangular lobe on inner margin of gonocoxite oral to base of appendage 2-a. Lindberg (1968) divided *T. lestagei* of northern Europe into 9 sibling species, but according to Pinder (1978) they are not separable as individuals. The present specimens are closely related to *T. lestagei* (Goetguebuer) but differ from it described by various authors from Europe in that appendage l-a is attached inside of appendage 1 and can be seen from above along its entire surface (in *lestagei* 1-a is situated largely behind 1), appendage 1-a is longer and more strongly curved inwards near the tip than in *lestagei*, and also in the body coloration (scutal stripes are shining black in *lestagei* according to Edwards, 1929,but yellowish brown in the present species). The structure of pupa of the present specimens is quite similar to those described by Lindberg (1969) with the *lestagei* aggregates.

A species of the *lestagei* group, *Tanytarsus tamaundecimus* Sasa, 1980,was collected from bottom sediment of a tributary of Tama River, Tokyo; the present species differs from it in the structure of appendage 2-a (setae longer in the present species than in *tamaundecimus)*, and in that the spine patches on abdominal segment IV of pupa are on a *tamaundecimus*; Sasa, 1980,plate 32).

(6) *Tanytarsus chuzesecundus,* sp. nov.

Materials studied. A total of 47 males and 41 females emerged from all of 6 samples collected at various depths of Lake Chuzenji, 29 April 1979, among which 12 males and 10 females were dissected and mounted on slides (holotype and paratypes; No. A 36:01—20). Exuviae of 11 pupae and 1 larva were also recovered and mounted (No. A 36:21—30). 20 males and 10 females of the same species were collected also on the shore of Lake Chuzenji on 28 July 1976 by Sasa and Shirasaka.

Male. A small midge with the body length of 3.02—4.32mm (3.56±0.40mm in measurements of 8 specimens mounted in gum-chloral), and the wing length of 2.19—2.71mm (2.42±0.13mm in measurements of 12). Body coloration generally brown, abdominal tergites with greenish tint.

Frontal view of head in Fig. 19-A. Antenna 14 segmented, including pedicel. AR 0.98 1.13 (1.04±0.06 in measurements of 10). Tip of antenna with about 2 short curved sensory setae and a short subapical seta (Fig. 19-B). Palp 4 segmented (45,

119, 157, 212 microns in the type specimen). With a pair of small frontal tubercles (Fig. 18-E). Eyes bare, with a short dorsomedial projection, ER 0.62—0.83 (0.70 in average of 8). Supraorbital hairs 8-12 on each side in 10 specimens. Clypeal hairs 12—20 (15.3 in average of 10).

Scutum brown, scutal stripes dark brown; scutellum yellowish brown; postnotum dark brown; halteres yellow. Thorax in Fig. 19—C. Dorsomedian setae 10 (3 specimens), 12 (4), 13 (2) and 14 (1). Dorsolateral setae 6 on each side, more rarely 7 or 8. Pre-alar setae 1 on each side in 8,2 on each side in 2 specimens. Scutellum with 4 setae in a transverse row in 7, 2 setae in 3 specimens. Wing membrane slightly brown, with macrotrichiae sparsely distributed between R 4+5 and Cu 2. Squama bare. Wing venation as in Fig. 18-A. fCu much diatal of r-m. Legs almost uniformly brown. LR relatively high, 1.97—2.28 (2.06±0.11 in measurements of 7). Front tarsi without long hairs (BR about 2.1), but femora and tibiae of middle and hind legs with long hairs. Apical scale of front tibia (Fig. 18-G) narrow and sharply pointed. Middle and hind tibiae with two terminal comb scales, which are widely separated from each other, both bearing a long spur (Fig. 18-H). Pulvilli absent.

Hypopygium in Fig. 19-H. Anal point rather thick and short, widest at the base, with a pair of ridges on both sides, 5—12 spine groups (5 in 3 specimens, 6 in 2,7 in 1, 8 in 2, 10 in 1, 12 in 1) between the ridges, and with several short hairs along the lateral margins (Fig. 19-D). Ninth tergite devoid of long hairs. Anal tergite bands separated from each other. Appendage 1 (Figs. 19-F,G) with a horn-like posterior process, a triangular inner process bearing 2 or 3 long hairs, with some 10 hairs along the lateral margins, and with a long and stout hair arising from a conspicuous tubercle situated on the inner margin. Appendage 1-a long and stout, reaching beyond tip of appendage 1. Appendage 2 in Fig. 19-E. Appendage 2-a rather short, about 20 microns in length, bearing several narrow, curved and sharply pointed setae. Gonostylus widest at about middle.
Fig. 19-H, D, F, G.

Female. Body length 2.92−3.33mm (3.18±0.18mm in measurements of 5), wing length 2.08—2.50mm (2.32±0.13mm in measurements of 10). Coloration generally as in male. Head in Fig. 18-B. Antenna 5 segmented (55, 110, 67, 78, 170 microns), second segment with double rows of bristles, the last segment with a subapical seta about 80 microns long (Fig. 18-D). Palp 4 segmented (Fig. 18-C). Ground color of scutum greenish brown, scutal stripes dark brown; scutellum yellowish brown; postnotum dark brown; halteres almost uniformly yellow. Wing in Fig. 17-A. Wing membrane with numerous macrotrichiae covering larger areas and more densely distributed than in male. Legs almost uniformly brown; LR 1.91—2.24 (2.06±0.13 in measurements of 6). Abdomen green to yellowish green. Cercus and spermathecae in Figs. 18-I, J.

Pupa. Thoracic respiratory organs (Fig. 20-A) tube-like, 0.73—0.87mm long (0.823±0.041 mm in measurements of 15) and about 0.08 mm wide, widest near base and apically tapering, the basal half being smooth but with numerous minute hairs on the apical half. The distribution of spines on abdominal tergites is characteristic to this species (Fig. 20-B). Tergite I with a basal band of spinulous area. Tergite II with a basal band of small spines (II-a), a central spinose area (II-b), a pair of lateral spinose areas (II-c), and an uniserial band of 94—130 (112.8 in average of 6) large recurved spines (about 10 microns long) along the caudal margin (II-d). Tergite III

to VI with a pair of oval and dark brown spinose patches bearing some 55, 60, 40 and 30 short spines, respectively (Figs. 20-E, F, H, I). Tergite III with a central spinulous area. Tergites IV to VII without spinulous areas. Tergite and sternite VIII each with a pair of proximal spinulous areas. Caudolateral scales on abdominal segment VIII rather narrow, highly pigmented, and bear 4 or 5 small marginal spurs (Fig. 20-J). Segments II to VI with 3 pairs, segments VII and VIII with 4 pairs of lateral hairs; those on segments II to IV fine and short, while those on segments V to VIII are long and flat swimming hairs. Anal segment with a fringe of 37—44 (40.5 in arerage of 5 pairs) swimming hairs along the lateral margins of anal lobes, and each with 2 long and filamentous hairs arising from the dorsal surface near base of the anal lobes (Fig. 20-K).

Larva. A single larval skin cast collected from sample N of Lake Chuzenji, 21 May, 1979. Head 352 microns long and 257 microns wide. Antenna (Fig. 21-A), 230 microns long, about 1.6 times as long as the mandible, 5 segmented (126, 40, 26, 12,4 microns); antennal tubercle 114 microns high and 47 microns wide at the base; antennal hair 48 microns long, arising from about middle of segment I; antennal blade 49 microns long and 0.54 times as long as the combined length of antennal segments II to V; Lauterborn's organs situated on a pair of long petioles, each 76 microns long. Mandible (Fig. 21-D) 138 microns long. Labial plate 100 microns wide, with 11 teeth, the central tooth widest and paler than the other teeth, with rounded anterior margin. Paralabial plates 102 microns wide and 23 microns long, almost touching in the middle and only 5 microns apart from each other. (Fig. 21-B). Maxilla Fig. 21-C, labrum and premandible Fig. 21-E. Base of preanal hair tuft Figs. 21-F,H.

Remarks. This species is considered to belong to the *chineyensis* group of genus *Tanytarsus* according to the classification of Reiss et Fittkau (1971), since anal point bears a pair of lateral ridges and with clusters between them but without microtrichiae excepting at base (Fig. 19-H), anal tergite bands are separated in the middle, appandage 2-a very short and bearing closely set simple setae(Fig. 19-E), and 1-a long and extending much beyond appendage 1 (Figs. 19-F, G). Among species of this group known from Europe, the present species is closest to *chineyensis* Goetghebuer and *palettaris* Verneau in that appendage 1-a is not twisted, but differs from both in the shape of anal point, in the numbers of clusters of spines (more than 10 in irreguar rows in the present species, several in a single row in other species of this group), and most characteristically in the shape of appendage 1. Among the species of this genus known from Japan, the present species is closest to *tamadecimus* Sasa, 1980 in the shape and structure of anal point, appendages 1, 2 and 2-a, but it differs in the structure of appendage 1-a (twisted in *tamadecimus*, simple in the present species).

(7) *Tanytarsus gregarius* Kieffer, 1909

Materials studied. A male, emerged 21 May 1979 from sample D of Lake Yunoko collected 28 April 1979 (No. 36:61). A male collected from wall on the shore of Lake Yunoko, 6 May 1981; 2 males emerged from bottom sediment of the same lake, 20 and 22 May, 1981 (No. A 50: 31—36). 4 males and a female emerged from sample B 9 of Lake Chuzenji; (Specimen Nos. A 50:31, 33, 36; A 51:31, 33, 35). 3 puPal exuviae associated with males. (Specimen Nos. A 51:31—36).

Male. Body length 3.27—4.33 mm, wing length 2.00—2.93 mm (6 specimens). Body coloration largely brown, i.e. antennal shaft and hairs brown, ground color of scutum yellow, scutal stripes reddish brown, scutellum yellowish brown, postnotum dark brown, halteres yellow, leg segments brown, abdominal tergites yellowish brown.

Head in Fig. 22A. Eyes with microtrichiae along inner margin, otherwise, bare, dorsomedial projection relatively short, ER 0.64, 0.76. Small frontal tubercles present. Antenna with 13 flagellar segments, AR 1.14—1.39. Antennal hairs long, AHR 0.49—0.57. Supraorbital setae 10 in the type, 12 and 15 on each side in the paratypes. Clypeal setae 16, 12and 18. Antepronotum without setae. Scutum with 10 18 dorsomedian setae, 7 12 dorsolateral setae, and 2 or 1 pre-alar setae. Scutellum with 6—10 setae in a transverse row.

Wing in Fig. 22-B. Squama bare. Anal lobe rather flat. R2+3 separated from R 1 and R4+5, ending about midway between ends of the two veins. Costa not extending beyond end of R 4+5. fCu under r-m. Anal vein not extending beyond fCu. Wing membrane with macrotrichiae on distal half only. Front tibia with sharply pointed terminal scale (Fig. 22-D). Middle and front tibiae with two separated terminal scales, both with a apur (Figs. 22-E, F). LR1 1.74—1.89, LR2 0.55—0.56, LR3 0.65—0.69. Front tarsus V 0.24—0.26 times as long as front tibia. Tarsi with long beards, BR1 3.5—4.9, BR2 6.1—8.4, BR3 6.3—8.3. Pulvilli well developed.

Hypopygium in Figs. 23-A, D, E. Band of ninth tergite widely separated from each other. Anal point widest at base either extending caudally as a short process (Fig. 23-A, specimens from Lake Chuzenji), or truncate apically (Fig. 23-D, specimens from Lake Yunoko). In both types, the anal point is armed with strong lateral ridges, and bears more than 10 spine clusters between them, but microtrichie are absent except at base. Ninth tergite with 2-5 short setae at base of anal point. Appendage 1 elongate oval, with 8—10 setae on dorsal side and along inner and outer margins (Figs. 22-H, 23-B). Appendage 1-a absent. Appendage 2 stout, slightly expanded apically, with some 12 recurved setae on dorsal side and 3 caudally directed setae on ventral side of apical portion. Appendage 2-a short, with transparent flat and leaf-like setae and many simple setae (Figs. 22-I, 23-C). Gonocoxite widest at about basal 1/4, tapering towards apex, with several straight setae on dorsal side and curved setae on ventral side of inner margin (Figs. 23-A to E).

Pupa. Three pupal exuviae associated with males were available for this study. Length of abdomen 3.57, 3.53, 3.47 mm. Thoracic respiratory organs slender and tube-like, 416, 408, 400 microns long and about 30 microns wide, tapering towards apex and sharply pointed apex, the walls being extremely thin and finely annulated but without spines and spinules on the surface (Fig. 24-A). Distribution of spines, spinules and hairs on abdominal tergite in Figs. 24 B, C. Tergite I with two pairs of setae but without spines and lateral hairs. Tergite II with a pair of somewhat triangular proximal spinose areas (II-a, II-b), a wide distal spinose area (II-c), and a band of strong, recurved spines along caudal margin in a uniserial row of 93, 85 and 75 spines (Figs. 24 B, D). Tergite III with a pair of long spine patches (Fig. 24-E). Tergite IV also with a pair of spine patches composed of long spines on inner side and small spines on lateral side (Fig. 24-F). Tergites V and VI with a pair of pineapple-shaped shinose areas composed of short spines (Figs. 24-G, H). Tergites VIII without spinose areas. The numbers of lateral hairs are 3 pairs on segments II to VI, 4 pairs on VII, and 5 pairs on VIII, among which those on segments

II to V as well as the first and second pairs on VI and the first, second and fourth pairs on VII are short and simple (s-seta), and the third pairs on VI and VII as well as all the five pairs on VIII are flat and filamentous (F-seta). Caudolateral scales on segment VIII bear several to numerous small spines (Fig. 24-I). Anal fins with two pairs of long, flat and filamentous hairs on dorsal side, and 36—36, 35 35, or 43 45 long filametous fringe hairs (Fig. 24-C).

Remarks. This species is morphologically a typical member of genus *Tanytarsus* van der Wulp, 1874, since wings with numerous macrotrichiae, squama bare, r-m short and parallel to wing axis, terminal combs of middle and hind tibiae separated and both with a spur, antenna 14 segmened, and anal point with spine clusters. Among the previously known species of this genus, the above described morphological characters of male are almost in well accordance with *T. gregarius* Kieffer 1909 of Europe which was redescribed and illustrated by Edwards (1929), Reiss & Fittkau (1971) and Pinder (1978). Especially characteristic to this species is the structure of appendage 1, which is roughly oval and its axis is parallel to the body axis, 1-a absent, anal point with lateral ridges and spine clusters between them. Among some 20 species of genus *Tanytarsus* recorded from Japan and the neighboring regions, those with spine clusters on anal point and without appendage 1-a is only *T. tamaseptimus* Sasa, 1980, but the present species differs from it in the shape of anal point, in the absence of long seta on ninth tergite, and in that both appendage 2 and 2-a being much shorer, 2-a with flat and leaf-like seta which is absent in *tamaseptimus*. The pupa of this species also belongs to the *gregarius* group of Bause (1914), because thoracic horns are about 0.4 mm long, tube-like, with pointed apex and smooth surface, abdominal segments III and IV with a pair of longitudianl row of long spines, V and VI with a pair of oval patches of short spines, caudolateral scales of segment VIII with about 10 small spines, and anal fins with two long, filamentous hairs on the dorsal surface besides some 40 long, filamentous fringe hairs.

(8) *Tanytarsus tamanonus* Sasa, 1980

Materials studied. A male emerged from sample B 8 of Lake Chuzenji, 18 May 1981 (No. A 51:28)

Male Body coloration largely yellow. Body length 1.93 mm, wing length 1.20 mm. Frontal tubercles wide and flat. Antenna composed of a pedicel and only 10 flagellar segments, AR 0.66. Antennal hairs relatively short, AHR 0.36. Eyes bare, widely separated, ER 1.60. Supraorbital setae 8 and 8. Clypeal setae 10 Dorsomedian setae 16, dorsolateral setae 10 and 8, pre-alar setae 1 and 1, scutellum with 6 setae. Squama bare. Wing with relatively small numbers of macrotrichiae only in distal half, roughly on a line between R 4+5 and M, M and Cu 1, and Cu 1 and Cu 2. fCu much beyond r-m, 68% and 36% level of with length, respectively. Terminal scale of front tibia with a long, narrow and sharply pointed spur. Terminal combs of middle and hind tibiae separated, and both with a long spur. LR1 1.74, LR2 0.42, LR3 0.49. BR1 3.5, BR2 4.9, BR3 5.4.

Anal point short, wide and with rounded apex, without lateral ridges, spine clusters absent, covered with numerous microtrichiae. Appendage 1 oval, 1-a long and knife-like. Appendage 2-a short and with stout, simple setae. Morphological description and figures in Sasa (1980, p. 25 and Figs Plates 26, 27).

Remarks. This species was originally collected and described from upstream parts of the River Tama. It can be rather easily identified by that antenna composed of only 10 flagellar segments, AR being small, wing with macrotrichiae only in the apical portion and fCu much beyond r-m, and by the peculiar structures of anal point, appendages 1 and 1-a.

(9) *Tanytarsus tamagotoi* Sasa, 1983

4 males and 3 females resting on a signboard on the shore of Lake Chuzenji were collecded with a sucking tube on 8 May 1981, all mounted on slides (Specimen Nos. A 51:21-24). They were morphologically almost identical with the type specimens described from the upstream parts of River Tama by Sasa (1983). Standard measurement data of the Chuzenji specimens are presented separately (page 100, 106).

(10) *Chironomus nipponensis* Tokunaga, 1940

A total of 68 males and 61 females emerged from samples collected at profundal zones of Lake Yunoko on 27-29 April 1979. Many adults were collected also with insect nets at the shore of the same lake. By examination of adult male, pupa and larva, they were identified as *C. nipponensis* Tokunaga, which was redescribed by Sasa (1978). The species collected by previous workers from Lake Yunoko and referred as *Chironomus plumosus* is probably a misidentification of this spdcies. A male emerged also from a bottom sample collected 29 April 1979 at a depth of 9 m.

(11) *Chironomus yoshimatsui* Martin et Sublett, 1972

Large numbers of mature larvae of this species were collected from a sewage ditch flowing into Lake Yunoko. Adults were recovered from bottom sediments of the ditch as well as from sand of the lake on the mouth of the ditch. Specimens of adults and pupal exuviae No. A 37:41-49.

(12) *Dicrotendipes lobiger* (Kieffer, 1921)

Materials studied. This is one of the common chironomid species breeding in Lake Yunoko. 4 males and a female were reared from bottom sediment samples collected by Mr. Toshio Iwakuma on 20 February, 1979. A total of 80 males and 77 females were reared also from bottom sediments of the same lake collected on 27 and 28 April, 1979;11 males and 11 females were dissected and mounted in gum-chloral; 12 pupal and one larval exuviae associated with the adults were mounted in gum-chloral; 3 larvae recovered from bottom sediment of the lake were also examined (Specimen No. A 39:51-72).

Male. Body length 4.69—6.15 mm (5.52±0.51 mm in measurements of 10 gum-chloral mounted specimens), wing length 2.52 -3.07 mm (2.83±0.18 mm). Ground color of scutum greenish yellow, suctal stripes brownish yellow, scutellum

greenish yellow, postnotum brownish yellow, abdominal tergites I-V yellowish green, VI-IX (including hypopygium) brown, halteres yellow except for the tip which is green; front femur largely yellow, tip of front femur, front tibia and all front tarsi dark brown;femur, tibia, tarsi I, II and basal half of tarsus III of middle and hind legs yellow or greenish yellow, distal half of tarsus III, and tarsi IV and V of middle and hind legs brown.

Head in Fig. 25-D. Antenna with 11 flagellar segments, AR 2.29—2.62 (2.46±0.10 in measurements of 10). Palp 4 segmented (81, 183, 174, 257 microns). With a pair of very small, roughly cylindrical frontal tubercles, about 4 microns high and 7 microns in diameter, 50 microns apart from each other (Fig. 25-F). Eyes with long dorsomedial projection, 160 microns distant from each other and 440 microns high, ER 0.35.

Antepronotum well developed. Scutellum with 16 hairs in uniserial row. Wing membrane slightly milky, squama fringed, r-m not darkened. Wing venation in Fig. 25-A. R 2+3 ending on costa closer to end of R 1 than end of R 4+5. fCu slightly distal of r-m. LR 1.48—1.65 (1.60±0.06 in measurements of 10). Longest hairs on front tarsus I 0.12 mm long and 3.2 times the diameter of the segment. Apical scale of front tibia with rounded margin (Fig. 26-C). Middle femur with a hook-like apical projection. Comb scales of middle and hind tibiae well separated, both with a long spur (Fig. 26-D). Pulvilli well developed, pad-like (Fig. 26-E).

Hopopygium in Figs. 26-A, B. Anal point about 55 microns long, dark brown and darker than rest parts of hypopygium, apically rounded and widest near the tip, strongly curved downwards. Gonocoxite only about 80 microns long and about 1/3 the length of gonostylus. Dorsal appendage roughly cylindrical, about 100 microns long and 20 microns in diameter, apically rounded and not expanded, with numerous microtichiae on almost the entire surface and with 5 hairs arising from near the tip; there is a beak-like projection near tip of dorsal appendage (Figs. 26-F, G). Appendage 2 extremely long and slender, about 190 micrens long and 17 microns wide in the middle, apically expanded and with some 20 long recurved setae only on the apically portion (Figs. 26-F, G). Gonostylus long and slender, inner margin concave, and widest at about the middle (Figs. 26-A, B).

Female. Body length 4.58—6.51 mm (5.19±0.61 mm in 10). Body coloration as in the male. Antenna 6 segmented (105, 167, 98, 102, 112, 233 microns, Fig. 25-E). Palp 4 segmented (114, 238, 236, 428 microns, Fig. 25-D). Frontal tubercles roughly conical, 15 microns high and 10 microns wide at base, and 65 microns distant from each other (Fig. 25-G). Wing venation as in Fig. 8-A. LR 1.73—1.87 (1.80±0.05 in 10). Cercus and spermathecae as in Figs. 25 J, K.

Pupa. Thoracic respiratory organs branched into about 45 filaments (Fig. 27-M). Distribution of spines and spinules on abdominal segments in Figs. 27-A, B. Sternite I with a pair of lateral spinulous areas, and a transverse band of narrow and sharply pointed spines (12—31 microns long) near the caudal margin (Fig. 27-F ; this segment is devoid of spines in most other chironomid pupae). Sternite II with a proximal band and a distal band of long and narrow spines (Figs. 27-G, H), and two pairs of lateral and sublateral spinulous areas. Tergite II with a spinose area in the middle near the caudal margin, and a transverse row of strong recurved spines [Fig. 27-C, 42—61 in number (51.1 in average of 7), each about 26 microns long] on the intersegmental membrane. Sternite III with a proximal transverse band of narrow and sharply pointed spines, and two pairs of lateral and sublateral longitudinal

spinulous areas. Tergites III to VI with a large central spinose area, and numerous small spinules on the intersegmental membrane. Sternite IV with a pair of caudolateral whirl-like spinose areas, and a pair of proximal spinulous areas. Sternite V with a pair of proximal spinulous areas, and a pair of caudolateral spinulous areas. Sternite VI with a pair of proximal spinulous areas, and large central and caudal spinulous areas. Tergite and sternite VII each with a proximal spinulous areas. Tergite VIII with a large spinose area. Abdominal segments II to IV with 3 pairs of short and simple lateral hairs, V to VII with 4 pairs and VIII with 5 pairs of long, flat and filamentous lateral hairs. Caudolateral scales on abdominal segment VIII characteristic to this species, bear one (occasionally 2 or 3) narrow, curved and sharply pointed spur (Fig. 27-L). Anal fins fringed with 36-66 (51.4) filamentous swimming hairs. Pupal exuviae of this species can be rather easily separated from those of coexisting other species by the color of abdominal terigtes being darker, by the presence of bands on sternite I, II and III, by the absence of spines on the proximal and middle portions of tergite II, and by the occurrence of narrow curved and sharply pointed spurs on caudolateral corners of abdominal segment VIII.

Larva. Color in life greenish yellow. Antenna 5 segmented (81, 24, 15, 17, 10 microns, LHR about 1.2) ; ring organ at about 1/4 from base of segment I; antennal blade 74 microns long and 1.12 times the combined length of segments II to V. Labial plate 180 microns wide, with 13 teeth almost evenly dark brown, the central tooth being widest and slightly notched on both sides. Paralabial plates 120 microns wide and 60 microns long, roughly fan-shaped (Fig. 28-A). Mandibles with 4 main and one small accessory cutting teeth, with a row of subapical comb hairs, and a basal brush composed of 4 main brush-like hairs (Fig. 28-D). Maxilla as in Fig. 28-C. Anterior pseudopods with numerous claws, which are slightly serrated (Fig. 28-E). No blood gills on abdominal segment VII. Anal segment in Fig. 28-H. Preanal hair tuft composed of 8 long and two short hairs arising from semiglobular base. Posterior pseudopods well developed. Anal gills leaf-like.

Remarks. The present species is a typical member of genus *Dicrotendipes* Kieffer, 1913 (=*Limnochironomus* Kieffer, 1920), since both combs of posterior tibiae bear a spur, pulvilli large and distinct, ventral appendages very long, slender and with long setae close to the tip only, and dorsal appendages are cylindrical and with several inward directed simple setae close to the tip. Among species known within this genus, the present specimens are closely related to *D. lobiger* (Kieffer) in the structure of anal point, ventral and dorsal appendages, gonostylus, and body coloration, as described or illustrated by Edwards (1929, p. 386), Towns (1945, p. 103) and Pinder (1978, p. 126, Fig. 158-C), and are tentatively identified as belonging to the same species. However, the present specimens differs from *lobiger* of Europe most remarkbly in the coloration of front leg (in *lobiger*, tip of front femur slightly darkened, tip of tibia more distinctly so, first segment of front tarsus whitish, narrowly dark at tip, remaining segments all dark, according to Edwards, 1929; tip of front femur conspicuously darkened, front tibia and all front tarsal segments entirely dark in the present specimens. Anal point, ventral and dorsal appendages in the present specimens seem to be longer and more slender than in the British *lobiger* illustrated by Pinder (1978). According to Towns (1945), the American specimens of *lobiger* have wing length of 3.4 mm (larger than 2.52-3.07 mm of the present specimens), AR value of 2.7 (slightly larger than in the present specimens), and LR1

value of 1.4 (smaller than 1.6 of the present specimens).

(13) *Paracladopelma camptolabis* Kieffer, 1913

Materials studied. 3 males emerged from a bottom sample collected at littoral zone of Lake Chuzenji, 28 April 1979, among which 2 were dissected and mounted, another fixed on pin after hypopygium was removed and mounted (No. 37:81-83). 2 pupal exuviae associated with the males (No. A 37:84).

Male. Body length of two mounted specimens 4.34, 4.32 mm, wing length 2.45, 2.34 mm. Body coloration as observed with the dry mounted specimen, antennal hairs brown, ground color of scutum yellow, scutal stripes reddish brown, scutellum and anterior margin of postnotum yellowish brown, other part of postnotum dark brown; halteres yellow; wing unmarked, r-m area pale; in the front leg, proximal 2/3 of femur yellow and its distal 1/3 brown, tibia and tarsi dark brown; in middle and hind legs, femur, tibia and tarsi I and II yellow, tarsi III to V brown; abdominal tergites almost uniformly balck and pruinose.

Frontal tubercles roughly globular, 8 microns long, 7 microns high and 30 microns apart from each other (Fig. 29-A). Eyes bare, with a narrow and long dorsomedial projection, ER 0.25, 0.34. Antenna with 11 flagellar segments, AR 2.07, 2.05, antennal hairs long, AHR 0.54, 0.55. Clypeal setae 14, 12. Supraorbital setae 15 or 16 on each side. Antepronotum well developed, not reduced in the middle and with 8 or 7 lateral setae. Dorsomedian setae 14 in both specimens, dorsolaterals 8, 9 or 11, pre-alars 3, 4 or 5. Scutellum with 10 or 9 setae. Wing in Fig. 29-B. Squama fringed with 4, 4 or 5, 8 setae. Wing bare, without dark marks, r-m area pale. R 2+3 separated from R 1 and R 4+5 and ending slightly closer to end of R 1 than to end of R 4+5. fCu slightly beyond r-m. Terminal scale of front tibia low and with rounded margin (Fig. 29-G). Terminal combs of middle and hind tibiae both with a short spur (Fig. 29-H). LR1 1.81, 1.90, LR2 0.61, 0.59, LR3 0.70, 0.69. Tarsi with relatively long beards, BR1 3.4, 3.0, BR2 5.6, 5.7, BR3 5.7, 6.0. Tarsus V of front leg relatviely short as a Chironomini, 0.25 times as long as front tibia. Pulvilli well developed (Fig. 29-I).

Hypopygium in Figs. 29-C, D. Ninth tergite without long setae in the middle. Anal point slightly expanded near apex, and apically rounded. Dorsal appendages pad-like, expanded distally, entirely covered with numerous microtrichiae, and with some 15 short setae along posterior margin (Figs. 29-E). Ventral appendages small, roughly rectangular, entirely covered with numerous microtrichiae but without long setae (Fig. 29-F). Inner margin of gnocoxite with 3 or 4 long setae (Fig. 29-D). Gonostylus long, slender, with slightly concave inner margin and widest at about apical 1/3, tapering towards apex (Fig. 29-C).

Pupa. Length of abdomen 3.83, 3.67 mm. Thoracic respiratory organs divided into numerous filiform branches. Distribution of spines and hairs on abdominal tergites II-VI in Fig. 30-A. Tergite II with uniserial transverse row of 42 or 52 recurved spines along the posterior margin (II-D, Fig. 30-C), otherwise free from spines and spinules. Tergites III to VI with multiple (3 or 4) rows of rounded spines along the posterior margin (Figs. 30-D, F, H, J) ; in addition, tergites IV to VI with a large central spinulous areas. Tergites VII, VIII and IX with a large spinulous area in the middle, but without spinose areas. Abdominal segments II, III and IV

with 3 pairs of short and simple (s) lateral hairs, V, VI and VII with 4 pairs, VIII with 5 pairs of long, flat and filamentous (L) lateral hairs. Anal fins with 43, 40 and 42, 44 filamentous fringe hairs (Fig. 30-B). Segment VIII without caudolateral scales, which is present in most other Chironominae pupae.

Remarks. The present species belongs to the *Harnischia* complex of Tribe Chironomini, since both dorsal and ventral appendages are reduced and pubescent, terminal scale of front tibia low and with rounded margin, terminal combs of middle and hind tibiae both with a short spur, and antepronotum not interrupted medially. Among genera of this complex, it falls in genus *Paracladopelma* Harnisch, since dorsal appendages are broad and pediform pads, ventral appendages are also small pubescent pad without long setae, mesal margin of gonocoxite with 3 or 4 long setae, and dorsomedian setae of scutum well developed. Among the known species of this genus, the present specimens are closest in the structure of male hypopygium, body coloration and values of AR and LR1 to *P. camptolabis* Kieffer 1913 described or illustrated by Edwards (1929, p. 387), Goetghebuer (1937,p. 35) and Pinder (1978, p. 132 & Fig. 164B), and are tentatively identified so. However, this genus has no frontal tubercles according to Edwards (1929) but the present specimens all have rather prominent frontal tubercles (Fig. 29-A). In the pupa, this species is unusual as a member of Chironominae in that caudolateral scales on segment VIII are absent, tergites II and III without oral and middle spinose areas, and caudal bands of spines on tergites III and IV mostly wide and with rounded margin.

(14) *Demicryptochironomus chuzenguartus*, sp. nov.

Materials studied. Tow males emerged from bottom sample collected 28 April 1979 at Station C of Lake Chuzenji, 0.7 meters deep. One dissected and mounted on slide (No. A 39:96), the other fixed on pin for observation of body coloration, and later mounted on slide (A 39:97, 98). Two females emerged from Station M. Three pupal exuviae associated with males and a female (A 39:99). All emerged on 30 May 1979.

Male. Body length 6.34 mm in the gum-chloral mounted specimen and 5.20 mm in dry fixed specimen. Wing length 3.27, 3.40 mm. Antennal hairs yellow, shaft dark brown; ground color of scutum greenish yellow, scutal stripes reddish brown, scutellum yellow, postnotum reddish brown; abdominal tergites greenish yellow and pruinose, hypopygium dark brown; wing unmarked, r-m area pale; front femur largely yellow and with an apical dark ring, tibia and tarisi dark brown; middle and hind femora, tibiae and tarsi I yellow, tarsi II to V dark brown.

Antenna with 11 flagellar segments, AR 2.76, 2.82, antennal haris long, these on the preapical antennal segment 0.57, 0.54 times as long as antennal shaft. Frontal tubercles prominent, 28 microns long, 10 microns in diameter and 30 microns apart from each other, divided into three semiglobular parts by two constrictions (Fig. 31-B). Eyes bare, with a long dorsomedial projection, ER 0.27, 0.29. Supraorbitals 17 or 18 on each side, clypeals 16 or 19. Antepronotum not reduced in the middle, with 15 or 16 lateral hairs on each side. Scutum with 18 or 27 dorsomedians, 16-20 dorsolaterals on each side, and 6-9 pre-alars on each side. Scutellum with 30 or 32 setae in two transverse rows. Wing in Fig. 31-A. Squama with 15 or 16 fringe setae. Wing membrane bare, slightly purple under transmitted light and without dark marks.

R 2+3 separated from R 1 and ending closer to end of R 1 than to end of R 4+5. fCu only slightly beyond r-m. Anal vein extending much beyond fCu. Terminal scale of front tibia with rounded margin (Fig. 31-D). Terminal combs of middle and hind tibiae both with a short spur (Fig. 31-C). LR1 1.60, 1.50, LR2 0.60, 0.61, LR3 0.63, 0.66. Front tarsus V 0.25 or 0.23 times as long as front tibia. Tarsal beards relatively short, BR1 2.3, 2.7, BR2 3.1, 3.2, BR3 4.6, 3.8. Pulvilli well developed.

Hypopygium in Figs. 31-E, G. Ninth tergite with rectangular posterior margin, and without long setae in the middle. Anal point long and slender, highly chitinized and dark. Both dorsal and ventral appendages highly reduced, both represented by small tubercles bearing two setae (Fig. 31-F). Inner margin of gonocoxite widely separated, forming right angle in the middle, with 5 or 6 long setae on both sides. Gonostylus ankylosed with gonocoxite, with a strong keel along dorsal margin, and numerous short setae on inner side.

Pupa. Thoracic respiratory organs divided into numerous filaments. Length of abdomen 3.04, 3.09, 3.14 mm. Distribution of spines and hairs on abdominal tergites in Fig. 32-A. Tergites II to VI with a large, roughly triangular central spinose area bearing numerous spines with rounded posterior margin (Fig. 32-B). Tergites II bears a transverese row of uniserial, recurved spines along posterior margin, composed of 134, 146 and 157 large recurved spines each about 20 microns long (Fig. 32-B, II-d). Tergites VII, VIII and IX with a spinulous area (Fig. 15-E, VIII). Sternite IV with a pair of whirl-like spinose areas in the caudolateral corners (Fig.15-D, IV-w). Abdominal segments II, III and IV with 3 pairs of short, simple lateral hairs, V, VI, VII with 4 pairs and VIII with 5 pairs of long, flat and filamentous lateral hairs. Caudolateral scales of segment VIII with 5 or 6 teeth (Fig. 32-C). Anal fins with 78-97 (85.7 in average of 3 pairs) fringe setae, and a pair of long, filamentous setae arising from dorsal surface. Genital sheaths extending much beyond anal fins (Fig. 32-F).

Remarks. This species was diagnosed as a member of genus *Demicriptochironomus* Lenz as defined by Saether (1977) and Pinder (1978), since wing membrane is bare, squama fringed, both combs of middle and hind tibiae with a spur, pulvilli well developed, both dorsal and ventral appendages highly reduced and represented by small tubercles bearing a few long setae but without microtrichiae, gonostylus long and with characteristic keel (Fig. 31-E), and frontal tubercles are absent. A key to 6 known species of males of this genus was prepared by Saether (1977, p. 133), but the present species differs from all of them in that small ventral appendage is present (if a tubercle regrded as ventral appendage in the present paper is taken as a part of dorsal appendage, then the shape and the numbers of setae are also quite different from the previously recorded males), in shape and structure of gonostylus and anal point, and in values of AR and LR from either of the above species.

(15) *Stictochironomus akizukii* (Tokunaga, 1940)

Materials studied. This is one of the few species commonly distributed among lakes in the Nikko area. Many adults were collected while resting on the shore of Lake Yunoko on 27 and 28 April, 1979. 21 males and females emerged from bottom

samples collected on the same day from Lake Yunoko. 14 males and 9 females emerged also from 4 out of 5 samples collected at various depths of Lake Chuzenji, 28 April 1979. Large numbers of pupae associated with the adults, and larvae either associated with pupae, or collected directly from the bottom mud of Lake Yunoko, were also examined (Specimens No. A 38:01—50, 71—100). Adults emerged also from bottom mud samples collected 6-8 May 1981, 3 males from Yunoko, 3 females from Marunuma, 2 males and a female from Suganuma, respectively (A 50:66-69, 19, the others preserved dry).

Male. Body length 5.07—6.74 mm (5.97 in average of 12). Wing length 3.00—3.55 mm (3.41 mm). Body coloration generally black, with white marks on legs and abdomen; ground color of scutum black and pruinose, scutal stripes black and inconspicuous, scutellum dark brown, postnotum black, halteres yellow. Leg coloration in Fig. 33-C; ground color of legs dark brown, all femora with a short white ring near apex, tibiae with two white rings, tarsus I largly white excepting apical portion which is dark, tarsi II and III white basally and dark apically, tarsi IV and V entirely dark. Abdominal tergites I to VI each with a silvery white band along the caudal margin. Terigtes VII, VIII and hypopygium black.

Head in Fig. 34-A. Antenna with 13 flagellar segments, AR 1.89-2.21 (2.02 in average of 10). Palp 4 segmented (102, 171, 220, 330 microns). Eyes bare, each with a long and narrow dorsomedial projection, ER very small (0.25—0.42; 0.36 in average of 10). Frontal tubercles absent. Supraorbital setae 12—16 (average 14.5). Clypeal hairs 22—32 (28.0).

Thorax and abdominal segments I, II in Fig. 33-B. Antepronotum reduced in the middle and not visible from above. Scutum with a hump (small tubercle) in the middle (hump in Fig. 33-B; a characteristic of this genus). Dorsomedian setae 20-22 (8 specimens), dorsolateral setae 14 24 (most frequently 16), pre-alar setae 5 or 6, rarely 7 or 9. Scutal setae 22-36, in 2 or 3 rows. Wing venation in Fig. 33-A. Wing with a dark spot around cross vein r-m. R 2+3 separated from R 1 and R 4 + 5. fCu under r-m. Legs with conspicuous white rings, as stated before (Fig. 33-C). Front tibia with a terminal scale of rounded margin, and 2 long terminal setae about 160 and 170 microns in length (Fig. 33-D). Terminal combs of middle and hind tibiae fused and surrounding about 2/3 of the terminal edge, with one short spur (Figs. 33-F, G). Femora and tibiae of middle and hind legs with long hairs, beards on tersi I moderate in length, BR1 1.8—2.6, BR2 2.2—2.9, BR3 4.1—5.6. Leg ratios relatively small, LR1 1.13—1.19 (1.16 in average of 8), LR2 0.57—0.62 (0.59), LR3 0.67—0.72 (0.70). Pulvilli small, about half as long as the claws (Fig. 33-E).

Abdominal terigtes with numerous hairs in irregular patterns. Eighth tergite nearly rectangular and not constricted basally. Hypopygium in Figs. 35-A, B. Ninth tergite with several long hairs in the middle. Anal point long, slender, parallel-sided and with rounded apex (Fig. 35-E). Dorsal appendages basally expanded and with several long setae and numerous microtrichiae, apical two thirds horn-like, strongly curved near apex, without microtichiae and with a long seta arising from near the apex (Fig. 35-C). Ventral appendages long, slender, with more than 30 strong and orally directed setae and a long terminal seta directed backwards (Fig. 35-D). Gonostylus widest at about basal one third, and with many strong setae on the inner margin (Fig. 35-F).

Female. Body length 6.12—7.55 mm (6.72 mm in average of 10), wing length 3.14-3.78 mm (3.40 mm in 10). Body coloration as in male;ground color of scutum

pruinose and black, scutal stripes black and inconspicuous, scutellum dark brown, postnotum black, halteres yellow. Wing with a conspicuous dark spot surrounding r-m. Legs with white bands as in male. Abdominal tergites each with a silvery white band along the caudal margin; hypopygium black.

Head in Fig. 34-C. Antenna with 5 flagellar segments (142, 85, 114, 118, 224 microns), last segment with 2 long subapical setae. Palp 4 segmented (179, 123, 125, 326 microns). Eyes with a long and narrow dorsomedial projection, ER 0.33—0.43 (0.37 in average of 10). Frontal tubercles absent. Supraorbital setae 14—18 on each side, clypeal setae 42 54. Lateral view of thorax and abdominal segments I and II in Fig. 33-B. Scutum with 18—20 (19.0 in average of 10) dorsomedians in two rows, 23—31 dorsolaterals on each side (27.0 in average of 10), 7—9 pre-alars (most frequently 7) on each side. Scutellum with 24 -35 (30.0 in average of 10) setae in 2 or 3 transverse rows. Wing venation in Fig. 33-A. Presence of a dark spot on r-m area is a distinctive character of this species. Cercus and spermathecae in Figs. 34-E, F.

Pupa. Length of abdomen 5.63 7.25 mm (6.23 mm in average of 8). Thoracic respiratory organs *Chironomus*-type, divided into more than 100 fine filaments. Coloration of exuviae definitely darker and the pale bands between abdominal segments more conspicuous than those of coexisting related species, *Stictochironomus multannulatus*. Distribution of spines, spinules and hairs on abdominal segments in Figs. 36-A, B. Tergite I without spines and spinules. Tergite II with a proximal transverse band of small spines (II-a), a central spinose area (II-b), a caudal band of small spines (II-c), and an uniserial band of large recurved spines (II-d), each spine about 30 microns long, the number varying 63—114 (average 83.3) in measurements of 8 specimens. Terigte III, IV and V also with a proximal band of spines, a large central spinose area partially connected with the caudal band of spines, but the spines on intersegmental membrane of tergite III and IV are much smaller than those of tergite II, and these spines are absent on intersegmental membrane of tergite V. Tergite VI with a broad spinose area near the oral margin (VI-a), a small central spinose area (VI-b), and a pair of caudal spinose areas which are separated in the middle (VI-c). Tergites VII and VIII with a pair of small spinulous areas in the proximolateral corners (VII-a, VIII-a). Sternites II and III with a large spinulous area in the middle (II-v, III-v). Sternites IV, V and VI with a pair of spinose areas in the caudolateral corners, among which those on sternites IV are largest and whirl-like (IV-w, V-w, VI-w). Sternites VI, VII and VIII with a proximal spinulous area. Caudolateral scales on segment VIII are brown in color, with a large terminal spur, 1 or 2 small spurs on the inner margin, and 3—6 small spurs on the lateral margin (Fig. 36-P). Anal fins each with 38-75 (52.2 in average of 8 pairs). Chaetotaxy of lateral hairs in Table 8 and Figs. 36-A, B; segments II, III and IV with 3 pairs of short lateral hairs, V, and VI with 3 pairs of long filamentous lateral hairs, VII and VIII with 4 pairs of long filamentous lateral hairs.

Larva. Color in life red or pink. Body length of mature larvae 8.4—9.7 mm in gum-chloral. Head brown in color. Antenna 6 segmented (93, 18, 12, 14, 10, 6 microns; Fig. 37-D), segment III wider and slightly shorter than IV; segment I 1.53 times as long as the combined length of segments II to VI; antennal blade 70 microns long and 1.15 times as long as the combined length of segments II to VI; Lauterborn's organ well developed, arising from tips of segments II and III. Labial plate (Fig. 37-

C) about 140 microns wide and 80 microns high, with 16 teeth, the middle 2 pairs with rather flat anterior margin and the rest teeth with rather pointed anterior margin; the middle pair about 9 microns wide, narrower and slightly shorter than the second pair of teeth, which are 12 microns wide; teeth of labial plates almost equally dark brown (central teeth not paler than the rests, as in some other species). Paralabial plates 150 microns wide and 65 microns high (ratio 2.3), only faintly striated (Fig. 37-C). Mandible 173 microns long and 67 microns wide, lateral margin smooth (not crenulated), with 5 cutting teeth, and a relatively long accessory tooth (about 30 microns) ; preapical comb composed of some 10 simple and curved setae (Fig. 37-A). Labrum, premandible and epipharynx in Fig. 37-B, maxilla in Fig. 37-E.

Claws on anterior pseudopods with minute teeth on apical portion (Fig. 37-F). Preanal hair tuft composed of 7 long and 2 short hairs, their base being semiglobular and not pigented (Figs. 37-H, I). Anal segment with a pair of long hairs on the dorsal side of posterior margin, and a pair of weaker hairs on the ventral side (Fig. 37-I). Blood gills absent. Anal gills short and conical. Posterior pseudopods with 16 strong claws (Fig. 37-G).

Remamks. This species was described first by Tokunaga (1940, p. 299) as *Chironomus (Stictochironomus) akizukii* with males and females collected at Toyohara (Sakhalin) and three localities in Japan, Fukuoka, Wakayama and Tokyo. Its immature stages as well as breeding places have remained unknown. The present population differs considerably from the original description in the values of AR and LR (2.5 and 1.4, respectively, according to Tokunaga, about 2.0 and 1.2 in this population). In the original desciption of *akizukii,* Tokunaga (1940) stated "This species is closely related to *C. histrio* Fabricius, in which, however, the black tibial middle rings are only found on hind legs, and the apical setae of the ventral appendages of male hypopygium are absent". However, in the description of *C. histrio* Fabricius of Edwards (1929, p. 401), it is stated that "four anterior tibiae whitish with the two ends black;hind tibiae also with a black ring in middle." Accrrding to Pinder (1978), Edwards'*C. histrio* is a synonym of *Stenochironomus sticuticus* (Fabricius), and in his drawing of male hypopygium, ventral appendage bears a long apical seta. Therefore, so long as these descriptions in literatures concern, there seems to exist no definite evidence to recognize *akizukii* as a species different from the European *histrio* or *sticticus*, which was described as early as in 1794, and is known to be distributed widely in Europe (Goetghebuer, 1937, p. 55).

(16) *Stictochironomus multannulatus* (Tokunaga, 1938)

This species was described first by Tokunaga (1938, p. 340) by female only, collected at Kyoto and Oita, by the name of *Chironomus (Polypedilum) multannulatus,* sp. nov.

Materials studied. A total of 14 males and 32 females emerged from samples collected at littoral zones of the Lake Chuzenji on 28 April 1979, among which 10 males and 8 females were dissected and mounted in gum-chloral, and the rests are preserved dry. Altogether 6 pupal exuviae associated with the adults are also available for the present study (No. A 38:51-69).

Male. Body length 4.35 5.25 mm (4.99 mm in average of 10). Wing length 2.31—2.45 mm (2.36 mm in average of 9). Body coloration characteristic to this

species, i. e. antennal hairs brown, antepronotum brown, ground color of scutum yellowish brown and largely purinose, median stripes pruinose and hardly distinguishable, lateral stripes dark brown and pruinose, dark brown, postnotum yellowish brown on basal 2/3 and drak brown on caudal 1/3, wing with dark marks as in Fig. 9-A, halters yellow; leg coloration in Fig. 39-J. Abdominal tergites I-V largely pruinose, but each with a transverse dark band, VI to IX largely dark.

Head in Fig. 38-B. Antenna with 13 flagellar segments, AR 1.58—1.81 (1.67 in average of 10), last segment with a subapical hair about 50 microns long, and about 10 short and curved sensory setae (Fig. 38-C). Palp 4 segmented (93, 155, 178, 289 microns). Eyes with a long dorsomedial projection, ER small, 0.28—0.38 (0.35 in average of 10). Supraorbital setae 12-16 (most frequently 14). Clypeal setae 18-24.

Antepronotum constricted in the middle, lateral hairs absent. Scutum and scutellum in Fig. 39-I. Most characterictic is the presence of a hump in the middle of scutum just behind the dorsomedian setae row. Dorsomedian setae 14 20 (usually 16 or 18), dorsolateral setae 10-15 on both sides, pre-alar setae 4, 5 or 6, rarely 7. Scutellum with 24—28 setae in double or triple rows. Wing with conspicuous dark and clear marks as in Fig. 38-A. R 2 + 3 separated both from R 1 and R 4 + 5, ending closer to tip of R 1 than to tip of R 5+5. fCu slightly beyond r-m. Legs (Fig. 39-J) with conspicuous dark and white rings, remarkably differing between femora, tibiae and tarsus I of the front and the middle-hind legs. LR1 1.26 —1.37 (1.32 in average of 9), LR2 0.54—0.61 (0.58), LR3 0.75—0.81 (0.78). Tarsi with relatively long beards, BR1 2.9—4.6 (3.5), BR2 3.1—5.1, (4.3), BR3 4.4—6.1 (5.1). Pulvilli well developed (Figz39-K).

Hypopygium in Figs. 39-A, B. Ninth tergite with 7—9 long setae in the middle, the band being separated (Fig. 39-A). Anal point long, slender, roughly parallel-sided and apically rounded with setae near base (Figs. 39-D, E). Dorsal appendage with a triangular base bearing microtrichiae and 3 long bristles, and an apical hook-like process bearing a very long, caudally directed lateral seta (Fig. 39-F). Ventral appedage not reaching beyond tip of gonocoxite, with some 14 strong recurved bristles from apical 2/3 of dorsal side, and a long caudally directed terminal bristle. Gonostylus is unusual in that it bears, besides numerous short and strong setae along the inner margin and on ventral surface, several very long bristles arising from the basal half (Figs. 39-G, H).

Female. Body length 3.92—4.73 mm (4.37 mm in average of 8). Wing length 2.35—2.70 mm (2.53 mm in average of 8). Body coloration as in male, i.e. antepronotum yellowish brown, ground color of scutum dark brown, scutal stripes pruinose, scutellum dark brown, postnotum pruinose, halteres yellow, wing with dark marks as in Fig. 9-A; legs with dark and white rings as in male; abdominal tergites I-VI basally dark brown, with white band along the caudal margin, which decrease in width by the number of tergites from about 1/2 of tergites II to only a narrow band in tergite VI; tergite VII, VIII and hypopygium dark brown.

Head in Fig. 38-G. Antenna (Fig. 38-F) composed of a pedicellum and 5 flagellar segments (126, 81, 93, 89, 155 microns), segment I with double rows of bristles, II to IV flask-shaped, V darker than the preceding segments, with more than 10 short and curved sensory setae, subapical long bristles absent. Palp 4 segmented (93, 192, 185, 311 microns). Dorsomedian projection of eyes wider than in that of male, ER 0.20—0.35 (0.30 in average of 8). Supraorbital setae 12-18 on one side (most commonly 15). Clypeal setae 18-28.

Thorax in Fig. 38-H. Antepronotum without lateral and dorsal setae. Scutum with 19—26 (most frequently 24) dorsomedian setae, 14—24 dorsolateral setae on both sides, and 4 7 (most frequently 6) pre-alar setae on both sides. Scutum with a hump in the center. Scutellum with 24—34 setae in multiple rows. Wing venation in Fig. 38-A. Squama with 10-16 fringe setae. fCu slightly beyond r-m. LR1 1.32 -1.44 (1.38±0.05 in measurements of 8), LR2 0.51 -0.63 (average 0.58), LR3 0.72—0.81 (average 0.75). Tarsi with relatively long beards, BR1 2.1—3.8 (2.7 in average), BR2 2.5 4.4 (3.2), BR3 2.8—5.4 (4.1). Pulvilli well developed. Cercus in Fig. 38-K, ear-shaped. Spermathecae in Fig. 38-L.

Pupa. Length of abdomen 3.80—4.20 mm (4.02 mm in average of 4). Color of exuviae slightly brown, definitely paler than that of *akizukii,* while the transverse dark band on abdominal tergite I (Fig. 40-A) more conspicuous than in the latter. Thoracic respiratory organs divided into numerous filaments (the *Chironomus*-type). Distribution of spines, spinules and hairs on abdominal tergites in Fig. 40-A. Tergite I with a median and a lateral pairs of spinulous areas, and a transverse dark band along the caudal margin. Tergite II with a spinulous area covering the large part of the segment (II-a, II-b, II-c partly or largely continuous; all composed of very small spines each measuring 3—4 microns), and a transverse band of recurved spines in a single row along the caudal margin (II-d), which is composed of 71-91 rather small recurved spines, each measuring about 20 microns (Fig. 40-B). Tergite III to V with large central spinose areas as in Fig. 40-A, in which spine groups a, b and c are discernible but united in the middle. Tergite III and IV with numerous small recurved spines in several rows on the intersegmental membrane. Tergite VI with a central spinose area, and tergites VII and VIII with a pair of spinulous areas near the oral margin. Sternites IV, V and VI with a pair of spinulous areas composed of narrow and sharply pointed spines in the caudolateral corners (Figs. 40-C, D). Sternite VIII with a pair of conspicuous caudolateral scales, each bearing 5 8 (most frequently 6) large and sharply pointed spines along the margin (Figs. 40-G, H). Segments II to VI with 3 paris, VII and VIII with 4 pairs of lateral hairs, among which those on segments II to IV are all short and simple (s-type), while those on V to VIII are all long and flat (L-type). Anal fins with 36 -41 (38.4 in average of 4 pairs) fringe hairs (Fig. 40-H).

Remarks. The present species was recorded first by Tokunaga (1938) by the name of *Chironomus (Polypedilum) multannulatus* sp. nov. based on females collected at light at Shimogamo and Hachijo, Kyoto, and Hita, Oita. Male and pupa have remained unknown. The structure of dorsal and ventral appendages of male hypopygium is similar to that of some *Polypedilum* species, but it should be transferred to the genus *Stictochironomus* Kieffer as it has a peculiar hump on scutum and legs with dark and white rings. The dark marks on wings are characteristic to this species (Fig. 38-A).

The structure of pupa of this species is clesely related to that of *S. akizukii* coexisting in the same lake, but can clearly be distinguished by the color of exuviae being definitely paler in the present species, by the more conspicuous dark band on abdominal segment I, and less conspicuous pale bands along the caudal margins of segments II to VII. The distribution of spines and spinules on abdominal segments are strikingly similar between the two species, but the size of spines on tergites II to VI are definitely smaller in the present species. The numbers of II-d spines (63—114 in *akizukii*, 71—91 in this species) are not of diagnostic character, but the numbers of

fringe hairs on anal fins are fewer in the present species (36—41) than in *akizukii* (38—75), though the ranges of variation are overlapping. The structure of caudolateral scales on segment VIII is also quite similar, though the numbers of spines are more numerous in average in *akizukii*.

Recently, Yamamoto (1980) reported on the occurrence of a total of 5 species of *Stictochironomus* in Japan, i, e. *S. akizukii* of Tokunaga, *S. histrio* of Asakawa, *Chironomus (Polypedilum) multannulatus* of Tokunaga, *S. pictulus*, and an undescribed species.

(17) *Phaenopsectra kizakiensis* (Tokunaga, 1940)

Materials studied. A total of 10 males and 8 females emerged from samples collected from Lake Yunoko on 20 February 1979 by T. Iwakuma. Many adults were found resting on walls and bushes at the shore of the same lake on 28 April 1979 and 6 May 1981, but no adults emerged from bottom sediments of the lake collected on the same days. 7 males, 5 females, 2 pupal exuviae and 5 larvae were dissected and mounted (Specimens No. A 37:01-23).

Male. Body length 6.56-7.66 mm (7.08 mm in average of 7). Wing length 3.39—4.53 mm (3.91 mm in 7). Body coloration almost entirely black or dark brown; antennal hairs black, scutum and scutellum black, scutal stripes and postnotum pruinose, halteres basally dark brown and apically yellowish brown, legs almost uniformly dark brown, abdominal terigtes black but partly pruinose.

Head in Fig. 41-B. Eyes with a long dorsomedial projection, ER small, 0.27—0.42 (0.36 in average of 7). Antenna with 13 flagellar segments, AR 2.26—2.53 (2. 36 in 7), with several short and curved subapical sensory setae. Supraorbital setae 14 24 on each side, clypeal setae 30—42. Frontal tubercles absent.

Dorsal view of thorax in Fig. 41-D. Antepronotum well developed and not interrupted in the middle, without lateral hairs. Scutum with 10—22 dorsomedian setae, 14—27 dorsolateral setae on each side, and 5 8 (most frequently 7) pre-alar setae on each side. Scutellum with 20 -30 setae. Wing in Fig. 41—A. Squama fringed with 15 18 hairs. Wing membrane slightly purple in transmitted light, and with numerous macrotrichiae in in cells R-M and M-Cu, also a few in cell Cu. R 2 + 3 ending much closer to end of R 1 than to end of R 4 + 5. Costa not extending beyond end of R 4 + 5. fCu almost under r-m. Anal vein extending near tip of Cu2. LR1 1.13—1.23 (1.17 in 7), LR2 0.54 0.61 (0.57 in 7), LR3 0.73—0.81 (0.76 in 7). Front tibia with 4 long subterminal setae each about 240 microns long, and a terminal scale with rounded apex (Fig. 42-F). Terminal comb scales of middle and hind tibiae contiguous, and both with a short spur (Fig. 42-G). Tarsi with long beards, BR1 5.6—9.0, BR2 4.4 8.7, BR3 5.0 -9.8. Pulvilli well developed (Fig. 42-H).

Abdominal tergites with numerous long setae almost evenly distributed. Hypopygium in Figs. 42 A-E. Anal point long, slender and parallel-sided, with rounded apex (Fig. 42-D). Dorsal appendage with a broad, setigerous base bearing 5—7 long bristles, and a bare distal process which is rectangularly curved near apex (Fig. 42-E). Ventral appendage long, parallel-sided, extending much beyond tip of gonocoxite, with a long apical seta and 21 orally directed setae arising from distal half of the dorsal surface (Fig. 42-C). Gonostylus widest at about middle, and bear some 20 strong setae along the inner edge, which are mostly forked into 2 to several

branches (Fig. 42-B).

Female. Body length 5.00—5.78 mm (5.46 mm in average of 5). Wing length 3.57—3.83 mm (3.65 mm in 5). Body coloration as in male; Scutum black and pruinose, scutellum dark brown, postnotum black, halteres with yellowish brown knob, legs dark brown, distal end of femora black, abdominal tergites black and pruinose. Head in Fig. 41-G. Eyes with a long and narrow dorsomedial projection, ER 0.29—0.33 (0.32 in average of 5). Frontal tubercles absent. Supraorbital setae 14—18 on each side. Clypeal setae 32-56 (46.2 in average of 5). Antenna composed of a pedicellum and 6 flagellar segments, (101, 96, 125, 130, 118, 251 microns), last segment with a subapical seta 120 microns long. Palp 4 segmented (123, 207, 227, 350 microns).

Thorax in Fig. 41-F. Scutum with 12-23 dorsomedian setae, 28 37 dorsolateral setae on each side, and 6—9 (most frequensly 7) pre-alar setae. Scutellum with 26-37 setae roughly in two transverse rows. Wing in Fig. 17-A. Wing membrane with macrotrichae more densely distributed than in the male. Squama with 14—22 fringe hairs. R 2+3 ending close to tip of R 1. fCu almost under r-m. LR1 1.13—1.27, LR2 0.55—0.59, LR3 0.71—0.73. Front tibia with a rounded terminal scale. Terminal comb scales of middle and hind tibiae almost contiguous with each other, and both with a short spur. Tarsi with relatively long beards, BR1 1.9—4.2, BR2 2.2—3.0, BR3 4.2—6.0. Pulvilli well developed (Fig. 42-I). Cercus in Fig. 18-G. Spermathecae two, both ovoid, almost colorless, 94×75 and 97×58 microns.

Pupa. Length of abdomen 5.89, 6.98 mm. Thoracic respiratory organs divided into some 11 tubes as in Fig. 43-A. Distribution of spines, spinules and hairs on abdominal terigtes in Figs. 42-B, C. Tergite II with a large contiguous spinose area covering roughly 2/3 of the surface (II-a, b, c), and an uniserial transverse row of 73, 75 relatively small recurved spines (II-d), each about 25 microns long. Tergites III and IV with a broad proximal spinose area (-a), a narrower central spinose area (-b, c), and a band of small spines in 3 or 4 transverse rows on the intersegmental membrane (-d). Tergites V and VI with similar but narrower central spinose areas, and without spines on the intersegmental membrane. Terigtes VII and VIII without spinose areas, and with a pair of proximal spinulous areas. Sternites IV, V and VI with a pair of spinose areas in the caudolateral corners (-w). The structure of caudolateral scales on segment VIII is characteristic to this tpecies, which are composed of a large terminal spine, 5 -7 smaller accessory spines on the lateral margin, and 1 or 2 smaller spines situated inside of the main spine (Fig. 43-D). Abdominal segments II to IV with 3 pairs of very short and fine lateral hairs; segments V and VI with 3 pairs, VII and VIII with 4 pairs of long, filamentous lateral hairs. Anal fins with 36-52 fringe hairs (Fig. 43-C).

Larva. Body length 7.8—9.2 mm. Color in life red. The structure of labial plate (Fig. 44-A) is characteristic to this species, roughly 185 microns wide and with 14 teeth, the first pair almost as wide as but slightly shorter than the second pair, both with rounded margin. Paralabial plates roughly fan-shaped, 176 microns wide and 77 microns high. Antenna 5 segmented (94, 34, 15, 10, 7 microns, Fig. 44-E), the first segment 1.44 times as long as the combined length of segments II to V; ring organ situated about 1/3 from base of antennal segment I; antennal blade 70 microns long and 1.07 times as long as the combined length of segments II to V; Lauterborn's organs attached to tip of antennal segment II are vestigial. Mandible in Fig. 44-D,

with 6 cutting teeth (including the dorsal accessory tooth), preapical mandibular comb, a simple accessory tooth some 26 microns long, and a basal brush composed of 4 main numerously branched hairs. Maxilla, labrum, premandible and epipharynx in Figs. 44-B, C, F. Claws on anterior pseudopods in Fig. 44-G, those on posterior pseudopods in Fig. 44-I. Bases of preanal hair tuft low and flat, anal fins short and roughly triangular (Figs. 44-H, J). Preanal segment without blood gills such as seen in some *Chironomus* larvae.

Remarks. This species was described by Tokunaga (1940, p. 290) with the name of *Pentapedilum (Phaenopsectra) kizakiensis* based on male and female reared from larvae collected on 25 March 1931 from the bottom of Lake Kizaki, Nagano-Ken. He stated that the blood-red larvae represented an important element in the benthal fauna of the lake, and also that the immature stages had been incorrectly reported in limnological papers as *Endochironomus* larvae.

In our present surveys of the lakes in the Nikko National Park, the adults were recovered from samples collected from the bottom of Yunoko Lake in February, but not from those collected in April, May and August. However, the adults resting on the wall of a boat house were collected on 28 April 1979 and on 6 May 1981, at the shore of the lake.

The present species is a typical member of the genus *Phaenopsectra* Kieffer, because the wing membrane bears macrotrichiae, squama is fringed with hairs, ventral appendages are slender and scarsely enlarged distally, and each of the terminal comb scales of middle and hind tibiae bears short spurs. It is the only member of the genus reported from Japan.

As pointed out by Tokunaga (1940), this species is most closely related to *Phaenopsectra punctipes* (Wiedemann, 1817) and *Ph. flavipes* (Meigen, 1830) in the structure of male hypopygium, but differs from both in body coloration, in AR of male, and in the number of segments of female antenna (composed of 6 flagellar segments in the present species, usually 5 in most other chironomid females). The morphology of pupa and larva of the present species is newly described in this paper. The pupa can be differentiated from those of related species by the structure of thoracic respiratory organs, caudolateral scales on abdominal terigtes, and the distribution pattern of spinose areas on abdominal tergites. In the larva, especially characteristici is the structure of teeth on the labial plate.

(18) *Microtendipes chloris* (Meigen, 1818)

Materials studied. A single male, emerged 26 May 1979 from Sample F of Lake Yunoko. First fixed on pin for study of body coloration, later dissected and mounted in gum-chloral (No. A 39:86, 87).

Male. Antennal hairs brown, ground color of scutum pruinose and black, scutal stripes shining black, scutellum black, postnotum shining black, wing milky white and unmarked, halteres yellowish white; in the front leg, femur yellowish brown and with a narrow apical dark ring, tibia and tarsus I black, tarsus II and III brown and with basal and apical dark ring, tarsus IV and V dark brown; in the middle and hind legs, femur and tibia brown but femur with apical dark ring and tibia with basal and apical dark rings, tarsus I yellow, II to V brown to dark brown; abdominal tergites I to V entirely or largely greenish yellow, III, IV and V with a faint oval

brown patch in the middle, VI to hypopygium dark borwn.

Body length 4.47 mm, wing length 2.63 mm. Head in Fig. 45-A. Eyes bare, with a long narrow dorsomedial projection, ER 0.38. Supraorbital setae 28 on both sides. Antenna with 13 flagellar segments, AR 2.79 (higher than other members of this genus known from Japan). Antennal hairs long, AHR 0.50. Clypeal setae 30. Palp 4 segmented, 0.22, 0.76, 0.80, 1.14 mm. Antepronotum reduced in the middle, with 3 or 4 lateral setae on each side (Fig. 45-B), Thorax in Fig. 45-C. Scutum with 6 dorsomedian setae, with 13 and 15 dorsolateral setae, and 5 pre-alar setae on each side. Scutellum with 24 setae in double rows. Wing in Fig. 45-D. Squama with 20 fringe setae. Wing membrane slightly purple in transmitted light. R 2+3 separated from R 1 at basal 2/3 but almost fused with it at distal 1/3. fCu almost under r-m. Anal vein extending much beyond fCu.

Leg coloration characteristic to this species. Front tibia truncate apically, without terminal scale and with several long subterminal setae (Fig. 45-E). Middle tibia with a narrow and a wide terminal comb, both bearing a short spur (Fig. 45-F). Hind tibia also with a narrow and a wide terminal comb, the former with a long spur and the latter without spur (Fig. 45-G). Front tarsus I only slightly longer than front tibia, LR1 1.18, LR2 0.66, LR3 0.75. Front tarsus V 0.18 times as long as front tibia. Tarsal hairs relatively short, BR1 2.0, BR2 2.4, BR3 3.3. Pulvilli small, less than half as long as claws (Fig. 45-H).

Hypopygium in Figs. 46-A, B. Band of ninth tergite almost touching in the middle but narrowly separated. (Fig. 46-B). Posterior margin of ninth tergite roughly semicircular. Anal point long, slender and slightly tapering towards apex, apically truncate (Fig. 46-C). Dorsal appendage sickle-shaped, with a broad base bearing one long and stout inner seta and 8 or 9 lateral setae in the middle portion (Figs. 46-D, E). Ventral appendages long, stout and widest at about middle, each bears 46 or 43 long, stout and orally or inwards directed setae on distal half (Fig. 46-F), but the long terminal seta such as seen in *Polypedilum* species is absent. Gonostylus stout, widest at about middle and with rounded apex, a longitudinal ridge on dorsal side, and with numerous rather short setae in the apical portion (Fig. 46-G). Eighth abdominal segment semiglobular in shape and constricted towards the base.

Remarks. This specimen is obviously a species of genus *Microtendipes* Kieffer, since one comb of posterior tibia with a spur and the other without spur, squama fringed with hairs, wings are bare and unmarked, vein R 2+3 almost fused with R 1, ventral appendages are long, straight and devoid of a long terminal seta, and dorsal appendages are horn-like and with several lateral setae. Among the known species of this genus, the structure of male hypopygium is almost identical with that of *M. pedellus* (De Geer, 1776) and *M. chloris* (Meigen, 1818), which are reported as common in Europe and differ from each other only in body coloration. The present specimen is closer to the latter and tentatively identified so in that front tibia is entirely black (in *pedellus* front tibia is pale medially, darkened at base and tip), but again differs from *chloris* in that abdominal segments I to V being pale green (in *chloris* these are dark green or blackish) and front femur being dark only at tip (in *chloris* blackish on apical one third or more). Two species of genus *Micropsectra* have been reported from Japan, *M. britteni* (Edwards) of Sasa (1980) and *M. tamaogouti* Sasa 1983, but the present specimen differs from both in the shape and structure of anal point, dorsal appendages, AR values, etc.

(19) *Polypedilum nubeculosum* (Meigen, 1818)

Materials studied. A total of 71 males and 60 females emerged from samples collected at littoral zones of Lake Yunoko. A total of 37 males and 22 females emerged also from samples collected at littoral zones of Lake Chuzenji. 7 males and 6 females from Lake Yunoko (No. A 39:01 -12), 2 males and 1 female from Lake Chuzenji (No. A 39:31, 32), as well as pupal and larval exuviae (No. A 49:13 to 39) were dissected and mounted on slides, others preserved dry or in alcohol.

Male. Body length 5.07—6.25 mm (5.85 mm in average of 9). Wing length 2.54—3.23 mm (2.96 mm in average of 9). Body coloration largely black or dark brown, i. e. antennal hairs dark brown, ground color of scutum and scutellum dark brown, scutal stripes and postnotum black, halteres yellow excepting the knob which is dark brown, legs almost uniformly brownish yellow, wings hyaline and with very faint clouds as in Fig. 47-A, abdomen almost uniformly black.

Head in Fig. 47-B. Frontal tubercles absent. Supraorbital setae 14—18 in number. Clypeal setae 28—37. Eyes with a conspicuous dorsomedial projection, ER very small, 0.27—0.41 (0.32 in average of 8). Antenna with 13 flagellar segments, AR 1.80—2.16 (1.95 in average of 9), tip of last segment in Fig. 47-C.

Dorsal view of scutum and scutellum in Fig. 48-F, scutum with 18—22 dorsomedian setae, 23—40 dorsolateral setae on both sides, and 8—16 pre-alar setae on each side. Scutellum with 26—32 setae roughly in two transverse rows. Wing membrane bare, hyaline and with very faint clouds as in Fig. 21-A. Squama with 22—35 fringe hairs. R 2+3 running very close to R 1, and ending much closer to tip of R1 than to tip of R 4+5. Costa not extending beyond tip of R 4+5. fCu only slightly beyond r-m. LR1 1.39 -1.54 (1.48 in average of 8), LR2 0.53—0.59 (0.57 in average of 8), LR3 0.70—0.79 (0.75 in average of 8). Tarsi I with short beards, BR1 2.4—3.5, BR2 5.0—7.8, BR3 3.3—7.6. Front tibia with rounded apical scale (Fig. 48-G). Apical combs of middle and hind tibiae almost contiguous, one has a long spur and the other without spur (Fig. 48-H). Tarsi with well developed pulvilli (Fig. 48-I).

Hypopygium in Fig. 48-A. Anal point in Fig. 48-B (lateral view) and Fig. 48—E (dorsal view), parallel-sided and with rounded apex in dorsal aspect. Dorsal appendage (Fig. 48-D) with a flat base bearing 1 or 2 long setae, and a horn-like process bearing one long lateral seta. Ventral appendage long and slender, with a long terminal seta directed backwards, and some 16 curved and caudally directed setae on the dorsal side (Fig. 48-C). Gonostylus swollen to near apex and with long setae on the inner margin (Fig. 48-A).

Female. Body length 4.37—5.21 mm (4.77 mm in average of 8). Wing length 3.13—3.59 mm (3.32 mm in average of 8). Body coloration as in male; scutum, scutellum, postnotum and abdomen almost uniformly black, halteres largely yellow but with dark brown knob, legs almost uniformly yellow.

Head in Fig. 47-D. Eyes with a narrow and long dorsomedial projection, ER 0.20—0.38. Supraorbital setae 13—16 on each side. Clypeal setae 40—54. Antenna with 5 flagellar segments, first segment with double rows of setae, last segment with 4 long subapical setae (Fig. 47-E). Palp 4 segmented.

Antepronotum well developed, not reduced in the middle, with 4—7 lateral setae on both sides. Dorsal view of scutum and scutellum in Fig. 47-F, scutum with 18—21 dorsomedian setae, 39—73 dorsolateral setae on each side, and 11—17 pre-alar

setae on each side. Scutellum with 30—42 setae roughly in two transverse rows. Wing membrane hyaline, with faint clouds as in Fig. 47-A. Squama with 24—34 fringe setae. Wing venation in Fig. 47-A. R 2+3 ending close to tip of R 1. fCu almost under r-m. Cercus and spermathecae in Figs. 47-G, H.

Pupa. Length of abdomen 5.21-6.10 mm (5.71 mm in average of 10). Thoracic respiratory organs divided into 8 tubes (Fig. 49-A). Distribution of spines, spinules and hairs on abdominal tergites in Figs. 49-B, C, D. Tergites II to VI with an oral spinose area with large spines (-a), central spinose area (-b) and a pair of distal spinose areas composed of small spines. In addition, tergites II has an uniserial transverse row of spines along caudal margin, which are composed of 54—70 (63.7 in average) large recurved spines all about 32 microns long (II-d) ; tergites III and IV with a caudal band of smaller recurved spines in 3—5 row (III-d, IV-d). Tergites VII and VIII with a pair of spinulous areas near oral margin. Caudolateral scales of segment VIII in Figs. 49-E, F. Abdominal segments II to IV with 3 pairs of short lateral hairs (sss), V and VI with 3 pairs (LLL), VII and VIII with 4 pairs of long, filamentous hairs (LLLL). Anal fins with 30—47 long, filamentous fringe hairs.

Larva. Morphological characters typical of genus *Polypedilum*, labial plate and paralabial plate in Fig. 50-A, antenna Fig. 50-B, labrum and epipharynx in Fig. 50-C, maxilla in Fig. 50-D, mandible Fig. 50-E, claws on anterior pseudopods in Fig. 50-F, claws on posterior pseudopods in Fig. 50-G, anal segment in Fig. 50-H.

Remarks. This is one of the few species recovered in common from the two lakes, Yunoko and Chuzenji. It is tentatively identified and described here by a name of *P. nubeculosum* (Meigen), but various measurement data are between European *P. nubeculosum* reported by Edwards (1929), Goetghebuer (1937) and Pinder (1978), and *P. tamagoryoense* Sasa from River Tama, Japan. The body size as expressed by wing length is 3.5—4 mm in the European *nubeculosum* according to Edwards (1929), 2.54—3.23 mm in the present population, 2.15—2.53 mm in *tamagoryoense;* likewise, the values of AR are 2.0—2.5, 1.80—2.16 (1.95 in average), and 1.59—1.78 (1.76), respectively, in the European *nubeculosum*, this population, and *tamagoryoense*. These three populations are characteristic in certain morphological characters and differ from other *Polypedilum* species, i. e. antepronotum is well developed and with lateral setae, wing vein R 2+3 is separated both from R 1 and R 4+5 and ending about midway between ends of the two veins, and fCu is almost under r-m. The structure of pupa and larva of the present population is almost identical with that described with those of *P. tamagoryoense* by Sasa (1983). *P. nubeculosum* was already recorded from Japan by Tokunaga (1940, p. 297) who gave brief accounts on morphology of male and female collected by him from Tokyo and Karahuto. He stated "male antennal ratio about 1", and this was a reason to separate *tamagoryoense* from *nubeculosum* by Sasa (1980, p. 37).

(20) *Polypedilum asakawaense* Sasa, 1980

Materials studied. 6 males and 5 females emerged from samples collected in littoral zones of Lake Chuzenji during May 1979. The whole bodies of 3 males and a female, hypopygium of 2 males, and 5 pupal exuviae were mounted on slides (No. A 39—97). A male emerged also from a sample collected May 1981 from the sample

lake (No. A 39: 98). 2 males emerged from a bottom sample of Lake Sainoko collected 4 September 1980. (No. A 50: 09, 10).

Male. Body length 3.90—4.66 mm. Wing length 2.34—2.69 mm. Scutum and scutellum brownish yellow, scutal stripes reddish brown, halteres yellow, postnotum dark brown, abdomen almost uniformly black, wing colorless, leg segments almost uniformly yellow. AR 1.80 1.98. AHR 0.39—0.59. ER 0.18—0.22. Supraorbitals 12—15. Clypeals 23—32. Antepronotum without setae. Dorsomedian setae 12—15, dorsolaterals 12—14 on each side. Pre-alars 4 or 6 on each side. Scutellum with 14—17 setae in uniserial transverse row. Wing in Fig. 51-A. Squama with 14—18 fringe setae. R 2+3 slightly separated from R 1, ending much closer to end of R 1 than to end of R 4+5. fCu beyond r-m. Terminal scale of front tibia with rounded margin, but with a sharply pointed process, and 3 long subapical setae (Fig. 51-B). Middle and hind tibiae with two separated terminal combs, one with a long spur, the other without a spur (Fig. 51-C). LR1 1.49—1.63; LR2 0.60—0.63; LR3 0.77—0.79. Relative length of front tarsus V to front tibia 0.29—0.31. Tarsi with relatively long beards, BR1 3.2 3.6, BR2 4.0—6.1, BR3 5.7—9.8. Pulvilli well developed.

Hypopygium characteristic to this species (Fig. 51-D). Eighth tergite roughly triangular, basally constricted to the middle. Anal point widest at base and tapering towards apex but with rounded apex. Dorsal appendage horn-like, abruptly curved at about middle forming a right angle, without basal and lateral setae. Ventral appendage (Fig. 51-E) broadest at base and tapering towards apex, with some 20 long recurved setae and a long terminal seta directed backwards. Gonostylus broadest at about basal 1/3, with rather pointed apex, bearing 6 long setae along inner margin.

Remarks. *Politalypedilum asakawaense* was described by Sasa (1980, p. 34) as a new species based on male, female and pupa collected from unpolluted upstream sites of River Minamiasakawa. The males, females and pupae of the present specimens recovered from Lake Chuzenji could not be differentiated morphologically from the type specimens.

(21) *Polypedilum tamanigrum* Sasa, 1983

Materials studied. A male emerged 3 June 1979 from sample N of Lake Chuzenji, a littoral zone 0.7 m deep. (No. A 39: 41).

Male. Body length 3.10 mm, wing length 1.70 mm. Body almost uniformly dark brown, leg segments yellowish brown, wing unmarked. Antenna with 13 flagellar segments, AR 0.77, antennal hairs relatively long, AHR 0.42. Eyes with conspicuous dorsomedial projection, ER 0.22. Supraorbital setae 12 on both sides, clypeal setae 14. Antepronotum reduced in the middle, lateral setae none. Scutum with 12 dorsomedian setae, 18 dorsolateral setae on each side, 5 pre-alar setae on each side. Scutellum with 20 setae. Wing unmarked (Fig. 51-F). Squama with 10 fringe setae. R 2+3 almost fused with R 1. fCu much beyond r-m. LR1 1.74, LR2 0.54, LR3 0.67. TR1 0.29, BR1 3.4, BR2 4.3, BR3 6.6. Hypopygium in Fig. 51-I. Anal point long and slender, with pointed apex. Dorsal appendage horn-like, slightly curved inwards, with 3 long basal setae, and a long lateral seta arising at about 3/5 from base. Ventral appendage (Fig. 51-J) long and slender, with 12 long recurved setae and a long terminal seta directed backwards. Gonostylus long,

slender, inner margin concave, and with 4 long setae on inner margin.

Remarks. This specimen was identified as *P. tamanigrum* Sasa, which was recovered in large numbers from unpolluted upstream sites of the River Tama. Body coloration, structure, and all measurement data fell within variation range of the type specimens.

(22) *Polypedilum* sp. "chuzetripodrum"

Materials studied. A male emerged 26 June 1979 from sample M of Lake Chuzenji (No. A 39: 46)

Male. Body length 2.76 mm, wing length 1.72 mm. Body coloration brown or dark brown. Ground color of scutum brown, stripes dark brown, scutellum brown, postnotum dark brown, leg segments yellowish brown but femora with apical dark rings. Wing unmarked. Both antenna missing. ER very small, 0.11. Supraorbital setae 10 on each side. Clypeal setae 16. Antepronotum reduced in the middle, lateral hairs none. Scutum with 15 dorsomedian setae, and 10 dorsolateral and 4 pre-alar setae on each side. Scutellum with 8 setae. Wing in Fig. 13-F. Squama with 8 fringe setae. Wing with 3 dark marks, one in cell between R 4+5 and M, another in cell Cu and extending to wing margin, the third posterior to and at about middle of stem vein Cu. R 2+3 well separated from R 1 and R 4+5, ending about midway between ends of both veins. fCu much beyond r-m. Leg ratios very high, LR1 2.11, LR2 0.63, LR3 0.73. TR1 0.32. Tarsi with long beards, BR1 3.6, BR2 5.0, BR3 9.0.

Hypopygium in Fig. 52-I. Ninth tergite with anal point wide and triangularly pointed, and a pair of narrow and sharply pointed processes flanking anal point. Dorsal appendage pad-like, entirely clothed with numerous microtrichiae, and with a long seta arising from near lateral and posterior margin. Ventral appendage (Fig. 52-J) with a long terminal seta, and 12 long recurved setae. Gonostylus long, slender, with slightly concave inner margin, and 5 long setae along inner margin.

Remarks. This species is a typical member of subgenus *Tripodura* of Towns (1945), since wing with dark marks, ninth tergite with a pair of lobes flanking anal point, and dorsal appendage is pad-like, covered with microtrichiae and without horn-like process. A total of nine species have so far been recorded from Japan within subgenus *Tripodura,* including a new species to be named as *hanamuroense,* among which six species have only one dark patch between veins R 4+5 and M and the rest three with two or three dark patches in this place. The present species belongs to the former group, but differs from the previously known members in that all femora have a dark apical ring, dorsal appendages have only one long seta, anal point is widest near apex, and ninth tergite has a pair of sharply pointed process flanking anal point. This is therefore probably a new species, but the scientific name is reserved untill more specimens become available.

(23) *Polypedilum tamagohanum* Sasa, 1983

Materials studied. A male emerged 28 May 1979 from a sample collected from Lake Chuzenji (Specimen No. A 39: 89). 5 males, 2 females and exuviae of 3 pupae

and a larva associated with the males were obtained also from sample B 7 of Lake Chuzenji collected May 1981 (Specimen Nos.A 51: 44—50)

Male. Body length 4.90 mm, wing length 2.22 mm. Body almost entirely dark brown, all femora, and middle and hind tibiae dark brown, front tibia and all tarsi yellow. Wing with five dark marks (Fig. 52-F). Frontal tubercles absent. Antenna with 13 flagellar segments, AR 1.49, AHR 0.54. Supraorbital setae 14 on both sides. Clypeal setae 16. Antepronotum without lateral setae. Dorsomedian setae 16, pae-alar setae 5 on each side. Squama with 20 fringe setae. Scutellum with 21 setae. Tip of front tibia in Fig. 52-G, tip of middle tibia in Fig. 52-H. LR1 1.46, LR2 0.67, LR3 0.81. TR1 0.25. BR1 3.1, BR2 6.7, BR3 6.9. Pulvilli well developed. Hypopygium in Figs. 52-I, J. The above morphological characters as well as structures of male hypopygium and other organs well fitted to those of *P. tamagohanum* collected and discribed by Sasa (1983) from the River Tama, and all the above measurement data were within variation ranges of the original specimens.

Pupa. Length of abdomen 2.93, 3.13, 3.17 mm. Thoracic respiratory organs divided into 8 branches of subequal length (Figs. 53-A, B). Disribution of spines and setae on abdominal tergites in Figs. 53-C, D and 54-A. Tergites II to VI with an oral transverse band of large spines (II-a to VI-a), a large central spinose area (II-a, b to VI-a, b) which are contiguous in II and III, incompletely separated in IV and V, and completely separated in VI. In addition, tergite II has a caudal uniserial band of large recurved spines (II-d), the number being 54, 59 and 67 in the three specimens. III and IV with double or triple rows of numerous small recurved spines. Tergites VII and VIII with a pair of small lateral spinulous areas but without spines. Sternites IV, V and VI with a pair of caudolateral whirl-like spinose areas (Fig. 53-E). Abdominal segments II, III and IV with 3 pairs of short and simple lateral haris, V and VI with 3 pairs, VII and VIII with 4 pairs of long and flat lateral hairs. Anal fins with long and flat fringe setae; 21, 22; 23, 25; 26, 26; in the 3 specimens. Caudolateral scales on segment VIII in Figs. 53-F, G.

Larva. (description of a larval skin associated with pupa and male, No. A 51: 50). Labial plate in Fig. 54-G, with 8 pairs of teeth, the central 3 pairs subequal in width (in most other larvae of *Polypedilum,* the second pair is small), 4th to 6th pairs acute angulate, 7th and 8th narrow. Paralabial plates fan-shaped (Fig. 54-G). Mandible in Fig. 54-C. Antenna (Fig. 54-B) 5 segmented, blade almost as long as the combined length of segments II to V. Labrum and premandible in Fig. 54-E, base of preanal hair tuft in Fig. 54-F, claws on posterior pseudopods in Fig. 54-G.

Remarks. Male and female of the present specimens are considered here as belonging to the same species as those reported by the name of *Polypedilum tamagohanum* Sasa, 1983 from upstream parts of the River Tama. It was stated by Sasa (1983, p.18 and Fig. 13) that the specimens from Tama are closely related in morphological characters to *P. laetum* (Meigen) of Europe but differ in the shape of dark marks on wing and in the shape and structure of dorsal appendages, ventral appendages and gonostylus, and thus they were judged as being a new species. The present specimens collected from Lake Chuzenji bear only one or two inner setae and only one lateral setae on dorsal appendage (European *laetum* has 4 inner and 2 lateral setae according to Fig. 168 D of Pinder, 1978), and only 6 to 8 recurved setae on ventral appendage (they are more than 10 in the European specimen). Male hypopygium of the Chuzenji specimens in Figs. 52-I, J. Pupa and larva of this

species are newly described here.

(24) *Polypedilum* sp. "chuzenudum"

Materials studied. A single male, emerged 20 May 1981, from bottom sediment of Lake Chuzenji at Station B9, dissected and mounted (Specimen No. A 51: 41).

Male. Body length 3.40 mm, wing length 1.75 mm. Body largely brownish yellow, i.e. antennal shaft and hairs brown, ground color of scutum yellow, stripes brownish yellow, scutellum yellow, postnotum brownish yellow, abdominal tergites yellow, hypopygium brownish yellow; wings unmarked, halteres pale yellow; leg segments almost uniformly brownish yellow.

Frontal tubercles absent. Eyes with dorsomedial projection of eyes roughly triangular, ER 0.09. Antenna with 13 flagellar segments, AR 1.14. Antennal hairs long, AHR 0.43. Supraorbital setae 7 or 8 on one side. Clypeal setae 13. Lateral pronotal setae absent. Scutum with 13 dorsomedian setae, 18 and 15 dorsolateral setae, and 4 pre-alar setae on each side. Squama with 5 fringe setae. Wing membrane bare, without dark marks and clouds. R 2+3 running close to R 1 and almost fused with it, but clearly separated from each other, R 2+3 running close to R 4+5 and ending closer to end of R 1 than to end of R 4+5. Costa not extending beyond end of R 4+5. fCu much beyond r-m, at 47% and 38% level of wing length, respectively. Anal vein extending much beyond fCu.

Tip of front tibia with angulate terminal scale. One terminal comb of middle and hind tibiae with a long spur, the other comb without spur. Tarsi of front legs missing from this specimen. Tarsi with long beards, BR2 6.2, BR3 9.7. Pulvilli large and bifid.

Hypopygium in Fig. 54-J. Anal point long, slender and parallel-sided. Dorsal appendages characteristic to this species, arcuate and horn-like wide basally and apically rounded, with neither lateral nor basal setae (Fig. 54-K). Ventral appendages slightly expanded apically, with 8 recurved setae (including a relatively long and rather straight subapical seta arising from the ventral side, which probably corresponds to the long, straight and caudally directed apical seta of most other *Polypedilum* species; Fig. 54-L). Gonostylus long, slender and with slightly concave inner margin, widest at about middle and apically pointed setae along inner margin much shorter than in most other *Polypedilum* species.

Remarks. This is a species belonging to the *nubifer* group of genus *Polypedilum*, since its dorsal appendages are simple, horn-like and devoid of the long lateral seta. Among 3 species of this group known from Japan, it is related to *P. asakawaense* Sasa and differs from the other two species, *P. nubifer* (Skuse) and *P. medivittatum* Tokunaga in that dorsal appendages are devoid of even the basal setae. However, this species differs remarkably from *P. asakawaense* shown in Plate 42 of Sasa (1980) in the shape and structure of anal point, dorsal and ventral appendages, and gonostylus. The European species of *Polypedilum* with such a combination of characters such as described by Edwards (1929), Gotghebuer (1937) and Pinder (1978) all bear long lateral seta on dorsal appendages and thus differ from the present species. The sciestific name of this specimen is reserved for future studies, since the material available for us is only a single male specimen whose front tarsi are missing.

(25) *Orthocladius(Orthocladius) chuzesextus,* sp. nov

Materials studied. 31 males and 35 females emerged from littoral zone samples (C, M, N, O) of Lake Chuzenji, collected 29 April 1979. 10 males and 7 females among them and 15 pupal exuviae were mounted for morphological study. Holotype: No. A 41: 51, male; paratypes: males No. A 41: 52 -60. Females and pupa, No. A 41: 61—73. A larval skin assocated with adult male and pupa, No. A41: 60.

Male. Body length 3.65—4.14 mm (3.90 mm in average). Wing length 2.50 —2.92 (2.71 mm). Body coloration almost uniformly black or dark brown, i.e. ground color of scutum nearly black, stipes black, scutellum dark brown, postnotum black, abdominal tergites dark brown, sternites brown; halteres brown; leg segments dark brown.

Head in Fig. 55-A. Eyes bare, with concave inner margin, ER 0.71 -1.09 (0.90 in average). Antenna with 13 flagellar segments, AR 1.64—1.87 (1.78 in average). Antennal hairs long, AHR 0.54—0.61. Supraorbital setae 10—15 (most frequently 10), clypeal setae 16-22 (18.2 in average). Antepronotum with 4—10 (most frequently 8) lateral setae. Scutum in Fig. 55-J. Dorsomedian setae 6-10, all minute and arising from small pits. Dorsolateral setae well developed, arising from large pale pits, 6—8 on each side. Pre-alar setae 3—5 (usually 4). Scutellum with 12 18 (most frequently 12) setae in a single transverse row (Fig. 55-J).

Wing in Fig. 55-I. Wing membrane bare, slightly purple. Anal lobe sharply produced. Squama with 24—35 (29.8) fringe setae. R 2+3 separated from R 1 and R 4+5, ending slightly colser to end of R 1 than to end of R4+5. Costa slightly produced beyond end of R4+5. All femora, middle and hind tibiae with long beards. Tarsi with relatively long beards, BR1 2.6—3.1 (2.8), BR2 2.6 4.9 (3.8), BR3 4.8—7.9 (6.3). LR1 0.67—0.69 (0.68), LR2 0.52—0.54 (0.53), LR3 0.56—0.59 (0.57). Front tibia with a long terminal spur 72 microns long (Fig. 55-C), middle tibia with two short terminal spurs 31 and 36 microns (Fig. 55-D), hind tibia with a long terminal spur 62 microns, a short terminal spur (47 microns), a terminal comb composed of 8 free spurs (26—55 microns, Fig. 55-G) ; middle and hind tarsus I and tarsus II also with two short spurs (Figs. 55-E, F). Pulvilli absent, empodium very short (Fig. 55-H).

Abdominal tergites with numerous setae almost evenly distributed excepting distal 1/3 of each tergum which is almost bare (Figs. 56-A, B). Hypopygium in Figs. 56-D, E. Anal point almost triangular, widest at base and with sharply pointed apex, with several lateral setae on both sides and microtrichiae on basal 2/3 (Figs. 56-F, G, H, I). Ninth tergite with several short setae on both sides of anal point but without long setae on dorsal surface. Inner lobe of gonocoxite simple (not double-lobed) and with rounded margin (Fig. 56-E). Inner margin of gonocoxite with a pair of small hairy processes near base (Fig. 56-D). Gonostylus Chinese spoon-shaped, with concaxe inner surface, widest near apex, with a strong apical spur and two accessory spurs.

Female. Body coloration almost uniformly dark brown, slightly paler than in male. Head in Fig. 55-B. Eyes bare, reniform and with slightly concave inner margin. Antenna with 5 flagellar segments, segments II to IV eliptical and without neck, last segment with a subapical seta. Dorsomedian setae short, decumbent and

arising from small pits as in the male. Dorsolateral setae 8—12, long, stout and arising from large pale pits. Scutellum with 12—14 setae in a single transverse row. Spermathecae two, both eliptical, about 85 microns long and 70 microns wide, dark brown in color (Fig. 55-K). Cercus ear-shaped, with a long ventral process, 190 microns long and 105 microns wide (Fig. 55-L).

Pupa. Color of exuviae darker in general than those of the next species, the difference is more conspicuous in the skin of thorax than that of abdomen. Length of abdomen 3.02—3.59 mm (3.28 mm in average of 10). Thoracic respiratory organs (Fig. 57-A) horn-like, 291—350 (313) microns long and about 35 microns in diameter, the surface largely smooth and with only a few spinules. Distribution of spines, spinules and setae on abdominal segments in Figs. 57-B and 58-A. Abdominal tergite I without spines and spinules; II without spines on oral half and middle portion (II-a absent), with a pair of lateral spinulous areas (II-b) and a caudal spinose area (II-c) continuous to it, and a band of large recurved spines (II-d) in roughly double rows on the intersegmental membrane, the number of spines 61—104 (81.6 in average of 10) ; tergites III to VI with a large spinose area in the middle; in addition, III to V with multiple rows of small recurved spines on the intersegmental membrane. Sternites IV to VI with a pair of whirl-like spine patches in the caudolateral corners, which are absent on other sternites. Numbers of lateral setae are 3 pairs in segments II to VI, 3 or 4 pairs in VII, and 4 or 5 pairs VIII, all narrow and simple (some setae on VIII may be forked), though the second pairs of segments II to VII and the last pair of VIII are longer and stouter than the others. Anal fins are nearly conical but with rounded apex, bear three stout and curved terminal bristles of subequal length, each measuring 184—223 microns (2.04 in average). Anal fins without terminal spines at the base of terminal bristles (Fig. 58-C).

Larva. A larval skin was recovered from sample N associated with adult male dead in pupal skin (No. 41: 60) The structures of male and pupa are identical to those of other *Orthocladius* specimens, excepting that bases of the lateral pair of terminal bristles of pupal anal fins are separated from those of the middle and the inner pairs (Fig. 58-E). Such an abnormality was seen also in a pupa of the next *Euorthocladius* species. The structure of various organs of this larva is shown in Figs. 58-F to L.

Remamks. This species is a typical member of genus *Orthocladius* van der Wulp, since wings and eyes are bare, dorsomedian setae on scutum are minute but dorsolateral setae are strong and arise from large pale pits, squama fringed, pulvilli absent, middle tibia and tersi I and II of middle and hind legs with two short terminal spurs, anal point bears several long lateral setae, and gonostylus is simple. This species further belongs to subgenus *Orthocladius* in the strict sense of Brundin (1956), because anal point is triangular and sharply pointed, and setae on scutellum are on a single transverse line. It also belongs to group C of subgenus *Orthocladius* of Edwards (1929, p. 336), since wing membrane is slightly brown, anal vein reaching far beyond fCu, Cu 2 almost straight, anal lobe of wing prominent, fCu scaresely beyond r-m, pulvilli absent and empodium is very short. Among the European species of this group, the present species is somewhat related to *O. rhyacobius* (Kieffer) according to the key prepared by Pinder (1978), because gonostylus is somewhat broadened distally, AR smaller than 2, and gonocoxite has a short finger-like lobe ventrobasally. However, the hairs on these lobes are much stouter and longer in the present species than in *rhyacobius* (c.f. Fig. 19-D of this paper and Fig. 36-C of Pinder 1978, p. 73), and also differs in the relative length of tarsi IV and V of

hind leg (the former shorter than the latter in *rhyacobius* according to Edwards, 1929, p. 345; the former longer in the present species, 195 and 150 microns, respectively). The present species does not fit to any of the six Nearctic *Orthocladius* described by Saether (1969).

A total of 20 species of chironomids were described by Tokunaga (1936, 1938, 1939, 1940, 1964, 1965) from the Japan region by the generic name of *Spaniotoma* or *Orthocladius,* among which 9 species were designated by him as belonging to subgenera other than *Orthocladius* s. str. , and the rest 11 as belonging to subgenus *Orthocladius* in the strict sense, as listed by Sasa & Yamamoto (1978). Of the latter group, *Spaniotoma (Orthocladius) akamusi* Tokunaga 1938 was designated by Sasa (1978) as belonging to a new genus, *Tokunagayusurika;* 4 other species, *kibunensis* Tokunaga 1939, *multannulata* Tokunaga 1949, *tentoriola* Tokunaga 1939, and *yosiii* Tokunaga 1964, are all devoid of anal point and thus should also be transferred to other genera, some probably to *Eukiefferiella.* Among the remaining 6 species with anal point, that of *nagaokensis* Tokunaga 1964 is hyaline and devoid of lateral setae and thus probably a species of *Eukiefferiella* in the present sense; the structure of pupa of the rest 5 species was described also by Tokunaga together with that of male and female adult, among which only *glabripennis* (Goetghebuer) of Tokunaga (1965) has the thoracic respiratory organs and anal fins typical of *Orthocladius* in the strict sense, and the others are considered as belonging to other subgenera or genera of Orthocladiini.

On the other hand, a total of 5 additional species of subgenus *Orthocladius* in the strict sense were described recently by the present author from Japan, *makabensis* Sasa 1979, *yugashimaensis* Sasa 1979, *tamanitidus* Sasa 1981, *tamaputridus* Sasa 1981, and *tamarutilus* Sasa 1981. Sasa (1979, p. 25) pointed out that *glabripennis* of Tokunaga (1965) was different from that redescribed recently from Europe by Brundin (1956) and Pinder & Cranston (1976), and is probably the same as *yugashimaensis* Sasa, 1979. The 6 species of *Orthocladius* s. str. now recorded from Japan can be identified by the following key.

A key to male and pupa of Japanese *Orthocladius,* s. str.

1-In male, body largely brownish yellow, scutal striped reddish brown; AR 1.1—1.5; wing length 1.5—1.7 mm. In pupa, anal fins without spines at bases of terminal bristles; VII-w (caudolateral whirl-like spine patches on abdominal sternite VII) absent; TRO (thoracic respiratory organs) with only few spinules …… tamarutilus

-In male, body largely black or dark brown, scutal stripes black; AR higher than 1.5; wing longer than 2.0 mm ……2

2 AR 2.2—2.9; wing 2.6—2.8 mm; in pupa, segment VIII with 5 pairs of lateral setae; (TRO with numerous spinules; anal fins with spines) …… *yugashimaensis*

-AR less than 2.0; segment VIII of pupa with 4 pairs of lateral hairs …… 3

3-TRO with few spinules; anal fins without spines …… 4

-TRO thickly covered with numerous spinules; anal fins with or without spines at bases of terminal bristles …… 5

4 Inner lobe of gonocoxite of male composed of double layers. Abdominal tergite II of pupa almost entirely covered by spines *makabensis*

-Inner lobe of gonocoxite of male single layered. Abdominal tergite II of pupa devoid of spines in the middle, spinose areas restricted to the lateral and caudal

portions ..... *chuzesextus*

5-Gonostylus of male narrow, and apically bent inwards. Abdominal tergite II of pupa largely bare exepting a pair of small spinose areas near caudal margin and a small patch of recurved spines on the inter-segmental mambrane; anal fins without spines ..... *tamanitidus*

-Gonostylus apically expanded, and not bent inwards. Abdominal tergite II of pupa almost entirely covered by spinose area; anal fins with spines ..... *tamaputridus*

(26) *Orthocladins(Euorthocladius)chuzeseptimus*, sp. nov.

Materials studied. A total of 189 males and 227 females emerged from samples collected at littoral zones of Lake Chuzenji on 29 April 1979. 25 males and 20 females among them were selected randomly and mounted on slides, partly together with associated pupal and or larval exuviae. (Specimens No. 41: 01-50, 81-96). Morphological studies of these specimens have revealed that they vary greatly in body size and some other measurement data. In the present study, the specimens are tentatively classified into two groups mainly by the body size and by the male antennal ratio, a *small* form including holotype male and additional 12 paratype males, and a *large* form including the rest 12 males. These two forms are described separately in the present paper, though further studies are needed in order to clarify whether they represent genetically independent populations, or such remarkable differences among the specimens are simply the morphological variations within the same species.

Male. A. The small form Body length 3.30-4.53 mm (3.90±0.44 mm in measurements of 11) ; wing length 1.90—2.45 mm (2.06±0.21 mm). Body largely black, i. e. antennal hairs black, ground color of scutum black, scutal stripes shining black, scutellum dark brown, postnotum black, halteres yellowish brown, abdominal tergites dark brown, leg segments dark brown.

Head in Fig. 59-A. Eyes bare, with concave inner margin, ER 0.90—1.00 (0.96).

Antenna with 13 flagellar segments, AR 1.76—2.36 (2.03±0.22 in measurements of 11). Supraorbital setae 14—16, clypeal setae 12—22. Dorsal view of thorax in Fig. 59-C. Antepronotum bare dorsally, with 6—8 lateral setae on both sides. Dorsomedian setae 8—10, all minute and arising from small pits. Dorsolateral setae well developed, 8—12 (most frequently 10) on each side, all arising from large pale pits. Pre-alar setae 4 or 5 on each side. Scutellum with 15—20 setae roughly in two rows (not on a line as in the last species). Wing membrane bare, smooth and brownish in color. Wing venation in Fig. 61-A.

R 2+3 separated both from R 1 and R 4+5. Costa ending at tip of R 4+5. Anal lobe conspicuously produced. The structure of legs as usual, LR1 0.75—0.79, LR2 0.53—0.56, LR3 0.58—0.60. Front tibia with a long terminal spur (Fig. 59-E). Middle tibia with two short terminal spurs (Fig. 59-F). Tarsi I and II also with two short terminal spurs (Figs. 59-G, H). Hind tibia with a long terminal spur, a short terminal spur, and a terminal comb composed of 11 free spurs (Fig. 59-I). Hind tarsi I and II with two short terminal spurs. BR1 1.6—3.3, BR2 2.5—3.5, BR3 2.6—4.0. Pulvilli absent (Fig. 59-J). Abdominal tergites with numerous long setae arranged as in Fig. 60-B.

Hypopygium in Fig. 60-I. Ninth tergite without long setae in the middle.

Anal point narrow and long, taparing towards apex and with more or less pointed apex, with several lateral hairs but without microtrichiae exept at base (Figs. 60-G, H, I). Inner lobe of gonocoxite composed of triple lobes (Figs. 60-I, J). Inner margin of gonocoxite with a flat triangular lobe near base (Fig. 60-H). Gonostylus tapering towards apex, with a ridge along dorsal margin (Figs. 60-F, I).

B. The large form. The male specimens tentatively grouped here under this category gave body length of 4.64—5.31 mm (4.99+0.24 mm in measurements of 10) and wing length of 2.66 3.33 mm (2.99+0.20 mm), and AR varying from 2.57 to 3.00 (2.69±0.13 in 10). ER 0.86 1.00. Supraorbital setae 14 18, clypeal setae 16—22. Antepronotum with 6—10 lateral setae. Scutum with 8—10 dorsomedian setae all minute, 8—14 dorsolateral setae all arising from large pale pits, and 4 or 5 pre-alar setae. Scutellum with 16—29 setae in double or triple rows. Squama with 24—29 fringe setae. Spurs on tibiae as in the small form. Tarsi I and II of hind and middle legs with two short spurs. Hypopygium in Figs. 60-A to E, similar in structure to the small form but gonostylus seems to be stouter, expanded in the middle and with more truncate apex than in the small form (Figs. 60-D, E).

Female. Of 22 female specimens mounted on slides, 12 apparently corresponded to the small form and gave body length of 2.26—3.03 mm (2.72±0.23 mm) and wing length of 1.86—2.50 mm (2.15+0.22 mm), while another 10 were singnificantly larger and gave body length of 4.00—4.43 mm (4.22±0.15 mm) and wing length of 2.76—3.13 mm (2.97±0.13 mm). The differences in body size and wing length between the two groups in the female specimens were more clearcut than in the males. However, there have so far been no differences detected between the two groups in the structure of various organs or in the chaetotaxy of various body parts. Head in Fig. 59-B, spermathecae Fig. 59-L, cercus Fig. 59-M, wing Fig. 61-A, all drawn from a small form.

Pupa. Pupae could also be classified into a small form and a large form. Of 28 pupal exuviae mounted for morphological study, 14 gave length of abdomen of 3.05—3.55 mm (3.37+0.35 mm) and that of thoracic respiratory organs 288 376 microns (345±25 microns), while another 14 gave length of abdomen of 3.80—4.50 mm (4.18+0.20 mm) and that of thoracic respiratory organs 408—488 microns (445+24 microns). Differences were observed also in the number of recurved spines on abdominal tergites, length of terminal bristles of anal fins, and the number of spines of anal fins, as will be discussed later. However, no essential differences could be detected in the basic structure of various organs or the distribution of spines between the two forms.

In both forms, thoracic respiratory organs are horn-like, apically tapering and with numerous spinules on the surface (Fig. 61-C). Distribution of spines and spinules on abdominal segments in Figs. 62-A, B. Abdominal tergite II almost entirely covered by small spines (Fig. 61-D) and with large recurved spines in three rows on intersegmental membrane (Fig. 61-D). The numbers of recurved spines (II-d) are very variable, 35—76 (56.9 in average) in the small form, and 76—146 (100.7) in the large form. Tergites III to VI also almost entirely covered by numerous small spines, and intersegmental membrane III to V with small recurved spines. Tergites VII and VIII with a large spinulous areas in the middle. Sternites II to IX with spinulous areas in the middle. Sternites II to IX with spinulous areas, as in Figs. 62-A, B. In addition, sternites IV to VII with a pair of whirl-like spinose patches in the caudolateral corners (Fig. 62-D). Segments II to VI with 3 pairs, VII with 4 pairs, and VIII with 5 pairs of lateral setae, which are all narrow and simple, and the second

pairs of all the segments as well as the last pairs of segments VII and VIII are longer and stouter than the rest pairs. Terminal segment with a pair of genital sheaths, and a pair of conical anal fins bearing 3 stout and hook-like terminal bistles of subequal length (216—256 microns long in the small form, 256—320 microns long in the large form), and small spines (2—4 in the small form, 4—6 in the large form) at bases of the terminal bristles (Figs. 63-A, B, C).

Larva. Color in life milky white. The structure of maxilla in Fig. 63-D, labrum and premandible in Fig. 63-E, mandible in Fig. 63-F, antenna in Fig. 63-G, labial plate in Fig. 63-H, claws on anterior pseudopods in Fig. 63-I, base of preanal hair tuft in Fig. 63-J, claws on posterior pseudopods in Fig. 63-K, anal segments in Fig. 63-L.

Remarks. The specimens of *Euorthocladius* described here are unusual in that the range of variation of body size, antennal ratio and some other measurement data are so great, that it was first thought that they might include at least two different species, such as judged in the next *Eukiefferiella* species. They are therefore tentatively classified into the *small* and the *large* forms, and description of morphological characters of adults and pupae is made for each group so far as some differences could be observed. It was also recognized that most of the *large* form specimens emerged in the laboratory soon after they were brought into the laboratory, while the small form mostly appeared after many days of laboratory rearings, under higher temperature and poorer nutritional conditions than in nature.

This speices is a typical member of subgenus *Euorthocladius* in the sense of Brundin (1956), since male anal point is narrow and slender, and setae on scutellum are not on a line such as in the last species. Among the chironomids described from Japan by Tokunaga by the generic names of *Spaniotoma* or *Orthocladius,* two species seems to belong to *Euorthocladius,* i.e. *kanii* and *suspensus.* However, both differ remarkbly from the present species in the structure of pupa, especially the shape of anal fins and distribution of spines. In the adult, this species is closely related in general charcters to the last species, *O. chuzesextus,* but differs essentially in the shape of anal point of male hypopygium and in the arrangements of setae on scutellum in both sexes. More remarkable differences are seen in the structure of pupae between the two species. The color of exuviae is generally darker in the present species than in the last, and can be separated easily by naked eye. Thoracic respiratory organs of this species are thickly covered with spinules, while those of the last species are provided with only a few spinules (cf. Fig. 61-C vs. Figs. 57-A, 58-D). Anal fins of this species have spines near bases of terminal bristles, while they are absent in the last species. (cf. Figs. 63-A, B, C vs. Figs. 58-A, B, C). Caudolateral whirl-like spine patches are presnt on sternites IV to VII in this species, but they are found only on IV to VI and absent on VII in the last species. The size and distribution of spinose areas on tergite II are also quite different between the two species. However, the structure of larva is again quite similar between the two species (cf. Fig. 58 vs. Fig. 63).

(27) *Psectrocladius yunoduarts,* sp. nov.

Materials studied. A total of 82 males and 105 females emerged from water plant samples collected in the littoral zones of Lake Yunoko on 27 April 1979. Large

numbers of adults, pupal exuviae and larvae were collected also on the shore of the lake. Specimens dissected and mounted on slides were 18 males, 8 females, 5 pupal exuviae and 5 larvae (No. A 40:01—30). The adult specimens are designated as holotype and paratypes. Specimens of the same species were collected also on the same day from waterplants of Lake Chuzenji at Shobuhama Beach, and 7 males, 3 females, 5 pupal exuviae and 5 larvae were also mounted on slides (No. A 31 - 50).

Male. Body length 4.23 –5.07 mm (4.67±0.38 mm in average of 10). Wing length (from arculus to tip of wing) 2.49—2.91 mm (2.72±0.13 in 10). Body coloration almost entirely black or dark brown. Antennal hairs dark brown. Ground color of scutum brown, yellow along the posterior margin; scutal stripes black; scutellum black but pruinose, postnotum black; halteres composed of black shaft and brown knob; legs almost uniformly brown. Abdominal terigtes largely dark grey, with indistinct black bands along the posterior margin of tergites II to VI. Hypopygium black. Head in Fig. 64-A. Antenna composed of a pedicel and 13 flagellar segments, AR 1.78 2.04 (1.91±0.09 in measurements of 10), apical part of last segment slightly expanded and with some 15 short, curved sonsory setae (Fig. 64-D). Palp 4 segmented (67, 122, 126, 163 microns). Eyes bare, roughly crescent-shaped, ER 1.12—1.42 (1.27 in average of 10). Supraorbital setae 6—8 on each side. Clypeal setae 12—17 (14.6 in average of 8).

Antepronotum well developed, dorsally bare, with 4—8 (most frequently 6) lateral setae on each side. Scutum without dorsomedian setae, with 10—15 (most frequently 12) dorsolateral setae, and with 4 or 6 (most frequently 4), pre-alar setae (Fig. 65-I). Scutellum with 2—5 (most frequently 4) setae in a transverse row. Wing venation in Fig. 64-C. Squama fringed with 30 36 hairs. Anal lobe strongly produced. R 2+3 separated from both R 1 and R 4+5, ending about midway between the latter two veins. Cu 2 almost straight. LR1 0.70—0.75, LR2 0.48—0.51, LR3 0.57—0.63. Front tibia with a long terminal spur (30 microns; Fig. 65-E) ; middle tibia with only one terminal spur (23 microns; Fig. 65-D) ; hind tibia with also only one terminal spur, a row of some 22 terminal comb hairs, and numerous spine-like hairs in the subterminal ragion (Fig. 65-F). Front tarsi without terminal spurs, but tarsi I and II of middle and hind legs with two short terminal spurs (Figs. 65-G, H). Tarsus I of all legs with relatively short beards, BR1 2.2—3.2, BR2 2.3—3.2, BR3 3.1—4.5. All legs with two claws both bearing some 3 strong basal hairs, a long and stout empodium, and two large pulvilli (Fig. 65-B).

Abdominal tergites II to VIII with numerous setae distributed almost evenly and arising from large pale pits (Fig. 65-A). Hypopygium in Fig. 65-J. Anal point well developed, parallel-sided and with rounded apex, bare apically (Fig. 65-K). Inner lobe of gonocoxite broad and roughly rectangular (Fig. 65-C). Gonocoxite in Fig. 65-C.

Female. Body length 3.04—3.96 mm (3.46 mm in average of 6). Wing length 2.60 –3.09 mm (2.91 mm in average of 6). Body coloration remarkably paler in general than in the male. Ground color of scutum yellow, scutal stripes reddish brown, scutellum brown, postnotum dark brown, halteres yellow; front leg segments dark brown excepting ventral aspect of femur which is yellow, middle and hind femora yellow, the rest parts of middle and hind legs brown; abdominal tergites yellowish brown, sternites yellow.

Head in Fig. 64-B. Antenna (Fig. 64-E) with 5 flagellar segments (90, 52,

50, 142 microns). Palp 4 segmented (60, 110, 112, 144 microns). Eyes reniform, without dorsomedial projection, ER 1.21—1.69 (1.52 in average of 6). Supraorbital setae 6—8. Clypeal setae 14 -20. Antepronotum with 6 -9 lateral hairs. Scutum without dorsomedian setae, with 9—13 (most frequently 10) dorsolateral setae and 4 6 pre-alar setae on each side; scutellum with 6—9 setae in a transverse row (Fig. 64-F). Wing venation in Fig. 64-C. Squama fringed with 32—48 hairs. LR1 0.67 -0.76 (0.72 in average of 6), LR2 0.46—0.50 (0.48), LR3 0.56—0.71 (0.58). Distribution of terminal spurs on leg segments as as in the male. All legs with a pair of well-developed pulvilli (Fig. 64-G). Spermathecae only slightly pigmented, roughly ovoid (Fig. 64-I). Cercus ear-shaped (Fig. 64-H).

Pupa. Length of abdomen 3.03—4.75 mm (4.03 mm in average of 8). Thoracic respiratory organs horn-like, with numerous small spines on almost the entire surface, length 270 -395 microns (Fig. 66-A). Distribution of spines, spinules and hairs on abdominal tergites in Fig. 66-B. Tergite I without spines and spinules. Tergite II without central spine patch, and with a band of spines along the posterior margin (II-c), the caudal row of spines being narrow, sharply pointed and directed caudad (Fig. 66-C). Tergite III with a central spinose area composed of the proximal row of long, narrow and sharply pointed spines (III-a). the middle row of small spines (III-b), and the caudal row of large recurved spines (III-c, Fig. 66-E) ; tergite III usually without central spine patch such as seen on tergites IV to VI, but occasionally bears one to several large spines in the center (Fig. 66-D). Tergites IV, V and VI with a central spine patch bearing strong, sharply pointed and caudally directed spines (Figs. 67-F, H, J), and a transverse band composed of various types of spines (Figs. 66-E, G, I) ; the numbers of spines in the central patch are quite variable, 3 to 38 in tergite IV, 6 to 58 in V, and 6 to 50 in VI in measurements of 10 pupae; the central spinose area bears three types of spines in tergites II, III and IV, namely a proximal band of strong, caudally directed spines, a middle band of small orally directed spines, and a caudal band of strong, recurved spines; (Figs. 66-C, E, G) ; the central spinose area on tergites V and VI is composed of only the caudally directed spines (Figs. 61-I, K). In addition, tergites II to VI with proximal spinulus areas of various sizes (Fig. 66-B). Terigtes VII and VIII without spines and spinules.

Sternites IV, V and VI with a group of long, narrow and caudally directed spines surrounded by numerous spinules in the caudolaterral corners (Figs. 66-L, M, N). Sternites II to VI with spinulous areas of varying sizes, usually a pair in the proximolateral corners and a band near the caudal margin. The distribution of lateral hairs is 2 pairs in abdominal segment I, 4 pairs in II to VII, and 5 pairs in VIII; the fourth pair on segments II and III is minute and easily overlooked; the lateral hairs on segments I to V are all short and simple (s-type), while those on VI to VIII are all long, flat and filamentous (L-type). The anal segment bears a spinulous area near the oral margin, and is composed of a pair of genital sheath and a pair of anal fins. The latter is fringed with 24—50 (37.9±8.0 in measurements of 8 pupae) long, filamentous hairs, and bears three strong, rigid and curved bristles each about 440 microns long.

Larva. Body length of alcohol-preserved mature larvae 6.2—7.5 mm. Color in life milky white. Antenna (Fig. 28-D) 5 segmented, 77, 13, 8, 6, 4 microns, segment I 2.5 times as long as combined length of segments II to V; ring organ near base of segment I; antennal blade slightly longer than combined length of

segments II to V; Lauterborn's organ rather conspicuous, attached to tip of segment II. Labial plate (Fig. 67-A) with 6 pairs of teeth, the central pair widest, slightly paler than the rests, and only slightly divided in the middle. Paralabial plates with numerous fine beards. Mandible in Fig. 67-E, with 5 cutting teeth, a relatively long inner spine, and a brush composed of some 7 simple setae. Labrum, epipharynx and premandible in Fig. 67-C; anterior labral setae (Hobart, 1972; or setae S I of Hirvenoja, 1973) are palmate and forked into some 8 fingers. Maxilla in Fig. 67-B. Claws on anterior as well as posterior pseudopods in Figs. 67-F, H. Preanal hair tuft composed of 5 long and 2 short hairs, its base about twice as long as wide, and bears two fine hairs (Fig. 67-I).

Remarks. This species is regarded as a typical member of the genus *Psectrocladius* Kieffer in morphology of adult, pupa and larva. In the adult, the presence of large pulvilli is most characteristic to this genus. Among members of this genus, it belongs to subgenus *Psectrocladius* in the strict sense, as its middle tibia has only one terminal spur. Among the European species of *Psectrocladius* described by Edwards (1929), Brundin (1956) and Pinder (1978), the present species is closest to *P. limbatellus* (Holmgren) in body coloration, in the structure of anal point and inner lobe of gonocoxite and in the absence of long tarsal beards, but differs from it in the more hairy anal tergite, in the longer R 2+3 (ending about midway between tips of R 1 and R 4+5 in the present species, closer to R 1 in *limbatellus*), and the larger value of AR. Among the species known from Japan, this species is closely related to *P. aquatronus* Sasa 1979, which was breeding in enormous densities in the bottom of concrete pools constructed in NIES, but again differs from it in body coloration (darker in the present species), in the pigmentation of terminal spur of gonostylus (black in the present species, paler in *aquatronus*), in the shape of gonostylus (broader in *aquatronus*), and of anal point (narrower and sharper in the present species). More remarkable is the differences in the sturcture of pupae between the two species; the central spinose areas on abdominal tergites IV, V and VI are divided in the middle into a pair of spine patches in *aquatronus,* while they are continuous and a single oval spine patch as in Figs. 66-B, F, H, J; in addition, the four pairs of lateral hairs on abdominal segment VI are all modified into long and flat swimming hairs in the present species, while in *aquatronus* only the second and fourth pairs are long and flat, and the first and the third pairs are short and simple such as those on the preceding segments.

The morphology of larva of the present species is also similar to that of *aquatronus* , but differs from it in the structure of labial plate (the central pair of teeth are less angulate, the incision in the middle is less pronounced in the present species), and in the shape and structure of the tubercles of the base of preanal hair tuft (shorter and devoid of spines in the present species as in Fig. 67-I, longer, cylindrical and bearing several spines in *aquatronus*).

Ecologically, this species is interesting in that the larvae are found always associated with water plants in the shallow littoral zones of the lakes, and not in the bottom sediments. The present species is one of few chironomids found in common with both Lakes Yunoko and Chuzenji.

(28) *Eukiefferiella chuzeoctavus*, sp. nov.

Materials studied. Three males emerged from sample N of Lake Chuzenji on 10, 12 and 18 May 1979; all dissected and mounted on slide (holotype:No. A 48:41; paratypes: A 48:42, 43).

Male. Body length 2.80, 2.50, 2.43 mm; wing length 1.83, 1.80, 1.90 mm. Body almost uniformly black, legs uniformly dark brown. Head in Fig. 68-A. Antenna with 13 flagellar segments, AR 0.75, 0.80, 0.87, last segment with a subterminal swelling bearing about 10 sensory setae, and a beak-like terminal process (Fig. 68-B). Palp 4 segmented, 64, 100, 131, 171 microns in the type specimen. Eyes reniform, without dorsomedial projection, widely apart from each other, ER 1.52, 1.41, 1.54. Supraorbital setae 5 or 6 on each side. Clypeal setae 6 or 7. Lateral pronotal setae 2, 3 or 4. Dorsomedian setae on scutum 12—14 in number, all very short and thin (about 15 microns in length), arising from small inconspicuous pits. Dorsolateral setae 8 or 11 on each side, all long (30 microns or longer), stout and arising from large pale pits. Pre-alar setae 4 or 3 on each side. Scutellum with 10, 7 or 8 setae in a transverse row.

Wing in Fig. 68-C. Squama with 12 15 fringe setae. Wing membrane bare, slightly brown. Anal lobe rather flat. R 2+3 separated from both R 1 and R 4+5, ending closer to end of R 1 than to end of R 4+5. Costa not extending beyond end of R 4+5. Cu 1 ending below end of R 4+5. Cu 2 only slightly curved. fCu beyond r-m. Vein An extending far beyond r-m. LR1 0.63—0.67, LR2 0.47—0.55, LR3 0.55—0.60. Front tibia with a long terminal spur (55 microns), middle tibia with two short spurs (27, 15 microns), hind tibia with a long spur (58 microns), a short spur (11 microns), and a terminal comb composed of 15 free spurs 28 55 microns long. Tarsi with relatively long beards, BR1 2.8 3.0, BR2 3.4 3.6, BR3 4.3—5.5. Tarsi I and II of middle and hind legs with two short terminal spurs, other tarsal segments without terminal spur. Pulvilli absent.

Hypopygium in Figs. 68-D, E. Ninth tergite without anal point, with 4 setae in the middle. Inner lobe of gonocoxite broadly rectangular, with sharply pointed posterior corner, with 7 short and curved setae on the dorsal surface and numerous short setae on inner margin and ventral surface. Gonocoxite with a pair of small triangular processes near base (Fig. 68-E). Gonostylus simple and without thickend ridge as in the next species.

Remarks. The genus *Eukiefferiella* was created by Thienemann (1926) based on larval characters designated as a group of *Orthocladius* by Potthast (1915), and later emended by Edwards (1929, p. 350) as a subgenus of his *Spaniotoma* to include a group of species with a combination of adult male characters. This concept was followed and further emended by Brundin (1956) and Pinder (1978). However, it obviously includes species with rather heterologous morphological characters in adults, such as anal point absent or present, eyes bare or pubescent, R 2+3 absent or present, etc. The present species keys out to this genus since wings are bare and plain, squama fringed, eyes bare, fCu much beyond r-m, Cu 2 almost straight, and both anal point and pulvilli absent. Among the known species of this genus, the present sepcies is closest to *E. ilkleyensis* (Edwards), which was described as a member of his group D *(Dactylocladius)* of subgenus *Orthocladius*, because anal point is absent, eyes bare, squama fringed, inner lobe of gonocoxite is broad and roughly rectangular, AR about 0.9, and costa does not extend beyond end of R 4+5.

However, the present species differs from *ilkleyensis* in the shape of inner lobe of gonocoxite (more angulate and sharply pointed), in the shape of gonostylus (expanded in the middle), and in the peculiar shape of the tip of antenna.

(29) *Eukiefferiella chuzenonus*, sp. nov.

Materials studied. Three males emerged from sample N and O of Lake Chuzenji on 28 May (No. 48:45, holotype) and 3 June 1979 (No. 48:47, 48, paratypes).

Male. Body length 2.13, 2.26, 2.06mm, wing length 1.30, 1.46, 1.50 mm, both smaller than the last species. Body almost uniformly dark brown, scutal stripes and postnotum black, halteres brown. Head in Fig. 69-A. Antenna with 13 flagellar segments, AR 0.45, 0.47, 0.69, smaller than in the last species, tip of terminal segment not expanded as in last species (Fig. 69-B). Palp 4 segmented, 46, 72, 35, 118 microns. Eyes with a relatively conspicuous domsomedial projection, inner margin remarkably concave, ER 1.00, 0.91, 0.79 (smaller than in last sepceis). Supraorbital setae 6—8, clypeal setae 4 or 6. Thorax in Fig. 69-C. Lateral pronotal setae 2 on each side. Dorsomedian scutal setae minute and decumbent as in the last species, only about 7 microns long and 4—6 in number, all arising from small inconspicuous pits. Dorsolateral setae 5—7 (most frequently 6) on each side, all strong (about 50 microns long) and arising from large pale pits. Pre-alar setae 3 or 4 on each side. Scutellum with 6 or 8 setae in a transverse row.

Wing in Fig. 69-D. Squama with 5—8 fringe setae. Wing membrane bare, plain, and slightly brown. R 2+3 separated from both R 1 and R 4+5, ending closer to end of R 1 than to end of R 4+5. Costa extending slightly beyond end of R 4+5. M ending almost tip of wing. Ends of R 4+5 and Cu 1 almost on the same level, both at 88% of wing length. Cu 2 almost straight. Vein An extending beyond fCu. r-m much closer to wing basis than fCu, at 40%, 50% of wing length, respectively. LR1 0.59—0.60, LR2 0.46—0.49, LR3 0.54—0.55. Front tibia with a long spur 38 microns (Fig. 69-E), middle tibia with two short spurs 14 and 15 microns (Fig. 69-F), hind tibia with a long spur 27 microns, a short spur 15 microns, and a terminal comb composed of 10 free spurs 20 25 microns (Fig. 69-G) ; tarsi I and II of middle and hind legs each with two short terminal spurs. Claws and empodium well developed, pulvilli absent (Fig. 69-H).

Hypopygium in Figs. 69-I, J. Ninth tergite without anal point, with 10 setae in the middle. Inner lobe of gonocoxite very broad and with rounded posterior corner, with some 7 short setae on the dorsal surface; gonocoxite without basal processes such as seen in the last species. Gonostylus with a stout terminal spur, and with a thickened and pigmented ridge along innermargin, which is forked near base (Fig. 69-K).

Remarks. This species is closely related in morphological characters of adults to the last species, and was first thought as variations within the same species. However, it was judged later that the two groups (Specimens No. 48:41—43 and 48:45—48) should be treated as different species, because both groups differ in wing length (1.80—1.90 : 1.30—1.50), antennal ratio (0.42 0.46 : 0.27—0.31), the shape of eyes and the eye ratio (1.41 1.54 : 0.79—1.00), the numbers of

dorsolateral scutal setae (8 -11 : 5 -7), squamal setae (12 -15 : 5—8), dorsal setae of ninth tergite (4 : 10, see Figs. 68-D and 64-K), etc. They differ also in the shape of the tip of antenna (see Figs. 68-B and 69-B), inner lobe of gonocoxite, and in the absence or presence of basal lobe of gonocoxite (Figs. 68-E and 69-L), and inner ridge of gonostylus (Figs. 68-D, E and 69-K, M).

Among the previously known species of this genus, the present species is most closely related to *E. devonica* (Edwards, 1929), since anal point is absent, eyes bare, squama with small numbers of setae, innerlobe of gonocoxite nearly rectangular, and AR being about 0.6. However, *E. devonica* differs from the present species in the shape of inner lobe of gonocoxite (with angulate posterior corner according to Pinder, 1978, Fig. 106A), the shape of tip of antenna being more conspicuously clubbed according to Edwards (1929, P. 349), and in the absence of inner ridge of gonostylus.

As for the occurrence of related species in Japan and the neighboring areas, Tokunaga (1938) recorded *Spaniotoma (Eukiefferiella) bicolor* (Zetterstedt) from Kyoto, but this species should be transferred to genus *Nanocladius (Microcricotopus),* as it has pubescent eyes, and bare, slender anal point. Tokunaga (1939) described *Spaniotoma (Eukiefferiella) takahashii* from Taiwan, which has no inner lobe on gonocoxite, and has a large triangular anal point. On the other hand, the species described by Tokunaga (1939) by the name of *Spaniotoma (Orthocladius) tentoriola* from Kyoto seems to be a member of *Eukiefferiella* in the present concept in the morphology of adult, pupa and larva, but differs from the present and the last species in that AR is about 1.3, and inner lobe of gonocoxite is narrow and apically pointed. Sasa (1979) described *E. yasunoi* from a mountain stream of Tsukuba, which differs from the present species in the shape of inner lobe of gonocoxite, and in that R 2+3 is almost fused with R 4+5. *E. tamaflavus* Sasa, 1981 was reported from a tributary of River Tama, which has anal point, but differs also from the present species in that vein R 2+3 is absent.

(30) *Paratrichocladius tamaater* Sasa, 1981

Materials studied. Three males emerged all on 26 May 1979 from sample N of Lake Chuzenji ; two pupal exuviae were associated with the males (Specimen No. A 48:01—04).

Male. Body length 2.73, 2.70, 2.60 mm. Wing length 1.60, 1.53, 1.70 mm. Body almost uniformly black, legs dark brown. Head in Fig. 71-A. Eyes highly pubescent, with a conspicuous dorsomedial projection, ER 0.86, 0.85, 0.78. Antenna with 13 flagellar segments, AR 0.89, 0.76, 0.93. Palp 4 segmented (50, 74, 107, 185 microns). Supraorbital setae 2 or 3 in the middle and 3 or 4 laterally on both sides. Clypeal setae 10, 7, 12. Thorax in Fig. 70-A. Lateral pronotal setae 5 on each side. Dorsomedian scutal setae 8, 10, 12, all minute, about 8 microns long, and arising from small inconspicuous pits. Dorsolateral setae 15 19 on each side, all stout, about 27 microns long and arising from large pale pits. Pre-alar setae 3 on each side. Scutellum with 12, 10, 9 setae in a transverse row.

Wing bare, slightly purplish, venation in Fig. 70-B. Squama with 4 7 fringe setae. R 2+3 running close to R 4+5, ending closer to end of R 4+5 than

to end of R 1. Costa extending a little beyond end of R 4+5. Cu 1 ending slightly proximal to end of R 4+5. fCu under r-m. Vein An extending far beyond fCu. Anal lobe produced rectangularly. Front tibia with a long terminal spur (45 microns; Fig. 70-C), middle tibia with two short spurs (21 and 20 microns ; Fig. 70-D), hind tibia with a long terminal spur (52 microns), a short terminal spur (20 microns), and a terminal comb composed of 12 free spurs 43—25 microns (Figs. 70-E, F). Tarsal segments without terminal spurs. LR1 0.58 -0.59, LR2 0.48—0.52, LR3 0.58—0.59. Front tarsus V 0.14—0.15 times the length of front tibia. Tarisi with medium sized beards, BR1 1.9 3.0, BR2 2.9—3.6, BR3 3.0 3.7. Tarisi V of front and middle legs in Figs. 70-G, H. Pulvilli absent.

Abdominal tergites with reduced numbers of setae, which are arranged roughly into the proximal transverse group, the distal transverse group, and the lateral groups. Hypopygium in Figs. 70-I, J. Ninth tergite with 7—8 dorsal setae, anal point absent. Inner lobe of gonocoxite almost triangular and with an accessory process bearing a long seta on the poterior margin. Gonostylus with a conspicuous tooth-like subapical process, and a stout spical spur.

Pupa. Two specimens studied by us has length of abdomen 2.10, 2.14 mm, with thoracic horn 206, 216 microns long (Fig. 71-B). Distribution of spines, spinules and setae on abdominal segments Figs. 71-C, D, and enlarged views of spines and spinules in Figs. 71-E, F, G.

Remarks. The present specimens are identified tentatively as *Paratrichocladius tamaater*, since the above described morphological characters of male and pupa are almost identical with those of the specimens collected from the upstream parts of the River Tama, and described and illustrated by the above scientific name by Sasa (1981).

(31) *Cricotopus yunoquintus*, sp. nov.

Materials studied. 5 males and 1 female emerged from samples collected at the littoral zones of Lake Yunoko, 28 February 1979 by T. Iwakuma ; all dissected and mounted on slides in gum-chloral media, excepting a male which is fixed on a pin. Holotype: male, emerged on 27 March 1979, on slide No. A 40:51. Paratypes: 4 male and 1 female, slide Nos. A 40:52—55. A male pupa, collected from the same container as the male on 17 April (A 40:56). No adult of this species were recovered from samples collected in April 1979 from the same lake.

Male. Body coloration largely black; ground color of scutum pruinose black, scutal stripes shining black and hardly discernible, scutellum and postnotum entirely black, abdominal tergites uniformly black excepting tergites I and IV, which are brown and slightly paler than the other tergites; hypopygium yellow and difinitely paler than the other parts of abdomen. Halteres brown excepting the tip of knob, which is yellow; femora of all legs dark brown, all tibiae with a long pale ring occupying the middle two thirds of the segment and dark at both ends, tarsi almost uniformly brown.

Head in Fig. 72-D. Eyes reniform, slightly concave medially, highly pubescent, ER 1.21 -1.43 (1.32 in average of 4). Antenna with 13 flagellar segments, AR 0.91—1.20 (1.07 in average of 3) ; with some 10 curved sensory setae near tip of last segment (Fig. 72-E). Supraorbital setae 4—6 (most frequently 5)

on each side. Clypeal setae 12 18 (13.8 in average of 4). Palp relatively long, 4 segmented, 59, 93, 126, 174 microns.

Thorax in Fig. 72-F. Antepronotum well developed, bare dorsally, with 4—6 lateral hairs on each side. Scutum with 18 25 dorsomedian setae, 32 43 dorsolateral setae in two or three irregular rows, and 4—6 supra-alar setae on each side; dorsomedian and dorsolateral setae all short and decumbent, arising from small inconspicuous holes. Scutellum with 24 -40 setae in multiple and irregular rows. Pre-alar setae 5 on each side. Wing in Fig. 72-A. Wing membrane bare, slightly brown. Squama with 5 or 6 fringe setae. Anal lobe produced rectangularly. Costa extending much beyond tip of R 4+5. R 2+3 separated from both R 1 and R 4+5, ending about midway between tips of R 1 and R 4+5. fCu slightly distal of r-m. Leg coloration in Fig. 73-E. Tarsi I relatively short, LR1 0.53 0.55, LR2 0.46—0.48, LR3 0.51 0.52. Middle and hind femora with a conical apical projection. Front tibia with a long apical spur (47 microns ; Fig. 73-F), middle tibia with two short apical spurs (20 and 22 microns ; Fig. 73-G), hind tibia with one long and one short spurs (36 and 16 microns), and a row of apical combs 40 24 microns long ; (Figs. 73-H, I). Tarsi without long beards, BR1 1.9 -2.1, BR2 2.0 —2.6, BR3 2.2—2.8. Tarsus V with a pair of claws, and an empodium; pulvilli absent, claws with several hairs at the base (Fig. 73-J).

Setae on abdominal tergites II, III and IV relatively numerous and almost uniformly distributed as in Fig. 73-D, the numbers being 14 32 in tergite II, 14—36 in III, and 18 46 in tergite IV in measurements of 4 males. Hypopygium in Figs. 73-A, B. Ninth tergite without anal point, with a median incision, and with a pair of semiglobular lobes bearing numerous setae (Fig. 73-A). Gonocoxite with a single inner lobe (Figs. 73-A, C). Inner margin of gonocoxite basally flattened and without projection (Fig. 73-B). Gonostylus in Figs. 30-A, B.

Female. (Description based on a single mounted specimen) : Body length 2. 10mm. Wing length 1.69mm. Body coloration as in male; scutum, scutellum and postnotum almost uniformly black, scutal stripes inconspicuous; tibiae with a middle white ring occupying about 1/3 of the segment, dark on both ends, femora and tarsi uniformly dark brown; abdominal tergites I and IV dark brown and slightly paler than the other tergites, which are all black; hypopygium white.

Head in Fig. 72-B. Eyes highly pubescent, reniform, with a concave inner margin, ER 1.15. Antenna with 5 flagellar segments (73, 52, 54, 48, 94 microns), last segment with a long subapical seta (46 microns; Fig. 72-C). Palp 4 segmented (58, 146, 122, 196 microns). Supraorbital setae 12 on each side. Clypeal setae 24.

Thorax in Fig. 72-G. Antepronotum with 8 lateral setae on each side. Humeral setae 4 on each side (these are absent in male). Dorsomedian setae 20, dorsolateral setae 40 on each side, all short and decumbent, arising from small pits. Pre-alar setae 4 on each side. Scutellum with 36 setae irregularly distributed. Leg coloration in Fig. 72-H. Front tarsus V in Fig. 72-I, pulvilli absent. Wing venation in Fig. 72-A. Numbers of setae on abdominal tergites II, III and IV being 34, 36, 42, all almost evenly distributed. Cercus in Fig. 72-K, spermathecae in Fig. 72-J.

Pupa. A pupal skin associated with a male was recovered on 17 April 1979. Length of abdomen 2.25mm. Color of pupal skin slightly brown. Thoracic respiratory organs simple and horn-like, 111 and 115 microns long and 15 microns wide, suface largely smooth but with a few spinules (Fig. 74-A). Distribution of

setae, spines and spinules on abdominal segments I to VII in Fig. 74-B. Tergite II without spines and spinules (this is a remarkable character of this species), and with a band of 56 (fewer than in the next *Cricotopus* species) strong recurved spines in two rows along the caudal margin (II-d). Tergite III with a central spinose area (III-b), a candal spinose area (III-c), and a band of small recurved spines on the intersegmental membrane (III-d). Spines on tergites IV and V nearly the same but spinose areas are larger than in III. Tergite VI with the middle (VI-b) and the caudal (VI-c) spinose areas but without spines on the intersegmental membrane. Sternites IV, V and VI with a pair of whirl-like spinose areas (Fig. 74-D) in the caudolateral corners. Segments VII to IX without spinose area but with spinulous zones as in Figs. 74-B, E. Anal fins short and roughly triangular, with three strong terminal setae of subequal sizes (81, 81, 78 microns ; Fig. 74-E). Lateral hairs on abdominal segments are 3 pairs on II to VI and 4 pairs on VII and VIII, all short and simple (Figs. 74-B, E).

Remarks. This species is a typical member of genus *Cricotopus* van der Wulp, since hypopygium is white, anal point absent, eyes pubescent and the dorsolateral setae of scutum are weak, decumbent and arise from small pits. Among the known members of this genus, it seems to be most closely related to *C. reversus* Hirvenoja 1973 (*C. tibialis* of Edwards, 1929) in body coloration (largely black, all tibiae with middle white ring, other leg segments entirely dark), in the chaetotaxy of abdominal tergites (hairs on tergites II to IV almost evenly distributed and not very much reduced), and in the structure of male hypopygium (inner margin of gonocoxite flat, inner lobe of gonocoxite simple and almost conical). In the female, it is also closely related to that of *reversus* in body coloration, in the presence of humeral setae and the subapical bristles of the antenna. However, the present specimens are different from *reversus* of Hirvenoja (1973) in that abdominal tergites I and IV are difinitely paler than the rest tergites (they are uniformly black in *reversus*), in the fewer numbers of setae on abdominal tergites (14—36 on tergite III in the present species, 46—64 in *reversus*), and in the fewer numbers of setae on tergite IX (3—8 in the present species, 9—18 in *reversus*, according to Hirvenoja, 1973, p. 305).

The structure of pupa described here as that of *C. yunoquintus* (the single specimen which is not directly associated with the adult male, but was coexisting in the same container) is remarkably different from that of of *reversus* described by Hirvenoja (1973, p. 306). Abdominal tergite II is almost completely devoid of spines and spinules in the present species, while they are numerous and covering almost the entire surface in *reversus*; thoracic respiratory organs are about 0.2 mm long in *reversus* (about 0.1 mm in the present species) ; length of terminal bristles on anal fins is 0.14—0.17 mm in *reversus* according to Hirvenoja (1973, p. 307), and longer than that of about 0.08 mm in the present species.

(32) *Cricotopus trifasciatus* (Meigen, 1810)

Materials studied. A male was found among specimens collected by sweeping on the shore of Lake Chuzenji on July 28, 1976. 4 males and 2 females, emerged from samples collected on 28 April 1979 at littoral zones (0.3 m and 0.7 m in depth) of Lake Yunoko ; 2 pupae associated with the adults. (No. A 40:71 76). 3 males and 5 females, collected on the same day from littoral zones (0.7 m in depth) of the

Lake Chuzenji; 6 pupal skin and a larval skin associated with the adults (No. A 40: 61—67). 8 males and 8 females emerged from a sample collected at Lake Yunoko, and 3 males from that at Lake Sugenuma, both in May 1981.

Male (Meassurements with 4 specimens from Lake Yunoko and 3 specimens from Lake Chuzenji). Body length 3.56—4.39 mm (3.92 mm in average of 7). Wing length 1.95—2.24 mm (2.11 mm). Antennal hairs yellowish brown, antepronotum yellow, ground color of scutum yellow, scutal stripes dark brown, median stripe reaching only to about middle of scutum, scutellum and postnotum dark brown, halteres yellow. Coloration of leg segments in Fig. 76-F; in front leg, coxa, trochanter, proximal 2/3 of femur, and middle 3/4 of tibia white (slightly yellowish), while apical 1/3 of femur, proximal as well as apical 1/8 of tibia, and all tarsi dark brown; in middle and hind legs, apical 1/3 of coxa, entire trochanter, proximal 2/3 of femur, middle 3/4 of tibia apical 3/4 of tarsus I, entire tarsus II, and proximal 2/3 of tarsus III are white, while proximal 2/3 of coxa, apical 1/3 of femur, proximal as well as apical 1/8 of tibia, proximal 1/4 of tarsus I, apical 1/3 of tarsus III, and entire tarsus IV and V dark brown. Coloration of abdominal teriges in Fig. 75-H; tergites I, IV and VII almost entirely yellow, II, III, V, VI and VIII largely dark brown with a narrow yellow band along the oral margin, hypopygium white.

Head in Fig. 75-F. Eyes highly pubescent, with a fairly long dorsomedial projection, ER 0.85—1.00 (0.93 in 6, relatively small as a member of Orthocladiinae). Antenna with 13 flagellar segments; AR relatively high, 1.65—1.87 (1.70 in average of 6); last segment expanded near apex, with some 20 short and curved sensory setae in the apical portion (Fig. 75-G). Vertex with 1 or 2 pairs of setae, supra-orbital setae 3—5 (most commonly 4) on each side, clypeal setae 10—17.

Antepronotum well developed, with 3 or 4 lateral hairs. Scutum with 12—16 dorsomedian setae, 18—26 dorsolateral setae (all short, decumbent and arise from small pits), and 3, 4 or 5 pre-alar setae on each side; scutellum with 8—14 setae in a transverse row (Fig. 76-D). Wing bare, slightly milky. Wing venation in Fig. 75-A. Squama with 20—28 fringe setae (22.9 in average of 5 pairs, more numerous than 5 or 6 of *C. yunoquintus*). R 2+3 separated from both R 1 and R 4+5, ending slightly closer to end of the latter than to that of the former. fCu beyond r-m, (56% : 50%). Relative length of leg segments in Fig. 76-F. LR1 0.55—0.57, LR2 0.44—0.49, LR3 0.51—0.54. BR1 1.9—2.7, BR2 1.8—2.9, BR3 2.2—3.5. Front tibia with a long sinuate and barbed terminal spur (62 microns; Fig. 76-H), middle tibia with two short terminal spurs (28 and 30 microns; Fig. 76-I), hind tibia with a long terminal spur (63 microns), a short terminal spur (24 microns), and a terminal comb composed of some 12 simple spurs 32—62 microns long (Fig. 76-J); other leg segments without terminal spurs. Tarsi V with a pair of well-developed pulvilli (Fig. 76-K).

Abdominal tergites III to V with a middle group of 4 or 5 setae in a single longitudinal row, a pair of lateral groups of 10—15 setae roughly in double longitudinal rows, and a row of 2—7 setae along the lateral margins (Fig. 75-H). Hypopygium in Figs. 76-A, B. Ninth tergite dark brown, without anal point, and with a pair of small anal lobes bearing small spines (Fig. 76-C); central bristles on ninth tergites 8—16 (in 6 specimens, most frequently 11), all relatively short, about 30 microns in length (Fig. 76-A). Inner lobe of gonocoxite roughly triangular, dorsally without microtrichiae and with several short and curved setae, with some 10

bristles along the inner margin (Fig. 76-C). Inner margin of gonocoxite with a pair of setigerous tubercles near the base (Fig. 76-B). Gonostylus in Fig. 76-C, the terminal spur very strong and densely pigmented.

Female. Body length 3.12 3.71 mm (3.45 mm in average of 3), wing length 2.15 2.29 mm (2.23 mm). Coloration as in male, though slightly differing in legs (all tarsal segments of middle legs dark, hind tarsus I and II both with a basal and an apical dark ring, hind tarsus III, IV and V entirely dark; Fig. 76-G; cf. Fig. 76-F of male legs).

Head in Fig. 75-B. Eyes highly pubescent, medially concave, dorsomedial projection less conspicuous than in male, ER 1.11 1.16 (1.14 in average of 3). Antenna with 5 flagellar segments (Fig. 75-C). Palp 4 segmented (Fig. 75-D). Vertex with 1 or 2 pairs of bristles, supraorbital setae 4 or 5 on each side. Clypeal setae 13, 17 or 21. Thorax in Fig. 76-E. Antepronotum with 3 or 6 lateral setae, scutum with 16—23 dorsomedian setae, 22—26 dorsolateral setae, 4 6 pre—alar setae, and 6 humeral setae (these are absent in male) ; scutellum with 12—16 setae in a transverse row (Fig. 75-E). Wing venation as in male (Fig. 75-A). Squama fringed with 18—24 hairs. Leg segments in Fig. 76-G. Cercus in Fig. 75-J. Spermathecae in Fig. 75-I.

Pupa. Length of abdomen 3.25—4.15 mm (3.78mm in average of 6). Color of exuviae only faintly brown. Thoracic respiratory organs tube-like, almost the same in diameter through the entire length, with rounded apex, surface almost smooth, length 148 233 microns (188 microns in average of 8), diameter 15 —19 microns (Figs. 77-A, B). Distribution of spines and spinules on abdominal tergites in Fig. 77-C. Tergite II with a large spinose area covering almost the entire surface (II-a, b, c combined), each spine rather minute, and a band of large recurved spines (II-d) along the caudal margin (each spine measuring about 28 microns ; the number of spines 82—115 (98 in average of 6), in two relatively regular transverse rows (Fig. 77-D). Tergites III, IV and V with a large spinose area also covering almost entire surface, a transverse band of small recurved spines on the intersegmental membrane (Fig. 77-E). Tergite VI also with a large spinose area, but devoid of small recurved spine band on intersegmental membrane. Tergite VII, VIII and IX with spinulous areas as in Fig. 77-C. Sternites IV, V and VI with a pair of whirl-like spinose areas in the caudolateral corners (Fig. 77-F). Segment II to VII with 3 pairs, VIII with 4 pairs of lateral hairs, all short and simple. Anal lobe with three strong, short and brown terminal bristles, of which the inner pair (133 192 microns long, 150 microns in average) slightly longer than the middle and the outer pairs (118—185 microns long, 140 microns in average of 12).

Larva (Description based on a skin cast attached to a male pupa, dissected and mounted in gum-chloral). Labial plate (Fig. 78-A) 161 microns wide and 62 microns high ; with 11 teeth, almost evenly pigmented, the central tooth with rounded margin, the first pair of teeth widest and with notched lateral margin. Antenna (Fig. 78-D) 5 segmented, (54, 19, 9, 6, 4 microns), segment I 1.38 times as long as the combined length of segments II to V, with a ring organ at about basal 1/3; antennal blade 0.81 times the combined length of segments II to V; Lauterborn's organ small, arising from tip of segment II and attached to segment III. Mandible (Fig. 78-C) 193 microns long and 94 microns wide, with 4 cutting teeth, with crenulated lateral margin (cr), inner margin serrulated (sr), mandibular brush composed of 5 simple bristles. Maxilla in Fig. 78-B. Epipharynx with three

conical epipharyngeal teeth (Pecten epipharyngis of Hirvenoja, 1973, p. 304), premandible with two apical lobes (Fig. 78-E). Labrum in Fig. 78-F. Claws on anterior pseudopods apically serrulated (Fig. 78-G). Abdominal segments with a pair of hair pencils composed of some 20 long and fine hairs (Fig. 68-H). Preanal hair tufts composed of 6 long, stout bristles and two shorter hairs (Fig. 73-J), their based being roughly semiglobular, 41 microns in diameter and 45 microns high (Fig. 78-J). Posterior pseudopods with 16 strong and curved claws (Fig. 78-K).

Remarks. Ecologically, this species is interesting in that it represents one of the few chironomids found in common with the two lakes, Yunoko and Chuzenji. Morphological characters of adults, pupa and larva are almost identical with those described by Hirvenoja (1973, p. 290) and other authors for the European specimens of *Cricotopus trifasciatus* (Meigen). The present species is regarded as a member of the subgenus *Isocladius* in the sense of Hirvenoja (1973, p. 135), as its male has pulvilli, inner margin of gonocoxite with a setigerous basal lobe, and pecten epipharyngis of larva are conical and not needle-like. Coloration of thorax, legs and abdomen is peculiar to this species. Pupa of this species can be differentiated from those of related *Cricotopus* species by the presence of large spinose areas covering almost the entire surface of tergites II to VI, and by the short, stout and pigmented terminal bristles of anal fins. The larva is characteristic in that it has hair pencils on abdominal segments, and that its mandible is crenulated along the lateral margin and serrulate along the inner margin (according to Hirvenoja, 1973, p. 297, Fig. 186-6, inner margin of mandible of *C. trifasciatus* larva is smooth and not serrulate). Tokunaga (1936, p. 15) also recorded *Cricotopus trifasciatus* as being very abundant in Kyoto and Tottori of Japan, and gave morphological accounts of male and female, which are almost the same as in the present specirens from Nikko.

(33) *Bllia longifurca* Kieffer, 1921

Materials studied. A male, emerged 2 June 1981 from sample B 10, collected from a small stream on the shore of Lake Chuzenji (Specimen No. A 51:77). A female of this genus also emerged from sample B 9, bottom sediment collected at a depth of 13 m of Lake Chuzenji, mounted together with associated pupal skin (No. A 51:78).

Male. Body length 3.86 mm, wing length 2.16 mm. Body largely black or dark brown, ground color of scutum brown, stripes black, scutellum dark brown, postnotum black, abdominal tergites I to V dark brown, with a narrow pale area along posterior margin, VI to hypopygium black, leg segments almost uniformly dark brown. Head in Fig. 79-A. Eyes bare, both with a conspicuous dorsomedial projection, ER 0.40, very small as a member of Orthocladiinae. Supraorbital setae 30 on each side, clypeal setae 30. Antenna with 13 flagellar segments, AR 1.57. Antennal hairs long, AHR 0.51. Pronotum with 28 and 30 setae along entire length (Fig. 79-B). Dorsomedian setae absent ; Dorsolateral setae very many, 63 and 65 ; pre-alar setae 19, 16 : Scutellum as many as 65 setae (Fig. 79-C). Squama fringed. Wing unmarked, with numerous macrotrichiae all over the membrane. R 1 and R 4+5 running close together, R 2+3 nearly fused with R 1. Costa extending much beyond end of R 4+5. fCu slightly beyond r-m. Cu 1 ending

distal of end of R 4+5. Cu 2 almost straight.

Length of femur, tibia and tarsi I−V 1.04, 1.22, 1.04, 0.56, 0.43, 0.31 and 0.15 mm in front leg, 1.12, 1.46, 0.75, 0.48, 0.41, 0.26 and 0.15 mm in hind leg. LR1 0.85, LR2 0.51, LR3 0.52. (LR1 unusually high, LR3 unusually low). Front tibia with two long subterminal setae and a long barbed terminal spur (60 microns; Fig. 79-D). Middle tibia with two long barbed terminal spurs (72 and 77 microns Fig. 79-E). Hind tibia with two long barbed terminal spurs (76 and 104 microns), and a terminal comb composed of 10 free spurs 75—46 microns in length (Fig. 80-A). Tarsi without terminal spur. Tarsal beards medium in size, BR1 3.0. Pulvilli absent. Abdominal tergites with many setae almost evenly distributed. Hypopygium in Figs. 79-F, G. Ninth tergite with reticulate marks in the middle, 14 and 16 setae in the lateral portion, anal point absent. Gonocoxite almost cylinder-shaped. Inner lobe of gonocoxite (Fig. 79-H) long and finger-like, 144 microns long and 30 microns in diameter, slightly curved inwards, and almost entirely covered by minute setae. Gonostylus (Figs. 79-I, J) forked into two arms, outer arm smoothly arcuate and more than twice as long as the inner arm, apically pointed, with microtrichiae in the basal portion and 4 or 5 subapical setae. Inner arm bare and with rounded apex.

Female. Body length 2.86 mm, wing length 2.60 mm. Body almost uniformly dark brown. Head in Fig. 80-B. Antenna 6 segmented (Fig. 80-C). Scutum brown, scutal stripes dark brown, scutellum brown, postnotum black. Eyes bare, reniform and with concave inner margin, ER 0.82. Supraorbital setae 14 and 12. Clypeal setae 14. Dorsomedian scutal setae none, as in male; dorsolateral setae 26 and 25, pre-alar setae 7, scutellar setae 8 (Fig. 80-D). Fringe setae of squama each 27. Wing membrane with numerous macrotrichiae. LR1 0.76, LR2 0.52, LR3 0.61. Pulvilli absent. Spermathecae 2, nearly globular, 74×56 microns and 68×52 microns (Fig. 80-E). Cercus ear-shaped (Fig. 80-F).

Pupa. Thoracic respiratory organs horn-like, 420 microns long and 55 microns wide, with coarse spines and striae on the surface (Fig. 80-G). Abdominal tergites II to VI with large spinose areas, VII and VIII (Fig. 80-H) with spinulous areas but without caudal rows of spines such as seen in pupa of *Brillia japonica* (Sasa, 1981, Plate IV). Anal fins fringed with 18 and 20 long, filamentous hairs, and each with 3 long and curved bristles on the posterior margin, all about 280 microns long (these terminal bristles are about 2.5 times as long as those of *B. japonica*), as in Fig. 80-H.

Remarks. Two species of genus *Brillia* were recorded from Japan, *B. japonica* Tokunaga, 1939, and *B. modesta* (Meigen, 1830) of Tokunaga (1939), both from Kyoto. The former was redescribed by Sasa (1981) by male, female, pupa and larva collected from the River Tama. This male is the third species of this genus from Japan, and is tentatively identified as *B. longifurca* (Kieffer, 1921). The male of this genus is characterised by the wing covered by numerous macrotrichiae, antepronotum with setae along entire length, scutum without domsomedian setae but with numerous dorsolateral and pre-alar setae, gonostylus being forked into two arms, and inner lobe of gonocoxite being long and finger-like. The three Japanese species can be differentiated by that outer arm of gonostylus is about as long as the inner arm in *modesta*, the former about 1/2 of the length of the latter in *japonica*, and the ratio is about 1/3 in the present species. Gonostylus of the present species is longer and narrower than that of *japonica*. AR value of the

three species is roughly 1.1, 0.8 and 1.6, respectively. The present species differs from *B. longifurca* of Europe in which the value of AR is 2.5, and thus it is closer to *B. longifurca fulvofasciata* Kieffer, 1921, in which AR is 1.65, according to Goetghebuer (1940). Brundin (1956) stated that the larval habitat is in stagnant water in *longifurca* and in running water in *modesta,* but the present species was recovered from a small stream on the shore of Lake Chuzenji.

The female and the associated pupal skin described here were reared from bottom sample of Lake Chuzenji and obviously belong to genus *Brillia,* but may possibly be a species different from the male which was reared from a running water on the bank of the lake, because the numbers of dorsolateral and pre-alar setae are much fewer in the female than in the male. The pupa differs from that of *B. japonica* described by Sasa (1981) in that the terminal bristles of anal fins are much longer and thinner, the abdominal tergites VII and VIII are devoid of caudal rows of large spines, and the thoracic horns are much longer.

(34) *Diplocladius cultriger* Kieffer, 1908

Materials studied. Five males, all collected on the shore of Lake Yunoko in the morning of 7 May 1981 with insect nets while swarming in the air (Specimens No. 50:41—45).

Male. Body length 2.93—3.16mm (3.04mm in average of 5), wing length 2.10—2.26mm (2.19mm in 5). Smaller and darker than males of coexisting *Psectrocladius yunoquartus.* Body coloration almost uniformly black, i. e. ground color of scutum black and pruinose, scutal stripes shining black, scutellum dark brown, postnotum and abdominal tergites black, halteres pale yellow, leg segments dark brown, wing membrane milky white.

Head in Fig. 81-A. Antenna with 13 flagellar segments, AR 1.68—1.91 (1.79 in 5), last segment with short and curved sensory setae near tip (Fig. 81-B). Antennal hairs long, AHR 0.41—0.57 (0.50). Palp 4 segmented as usual. Eyes reniform, highly pubescent, ER 1.00 1.33 (1.16). Antepronotum with 2 setae on each side. Thorax in Fig. 81-C. Dorsomedian setae 6 or 8, all extremely small and being recognized only by small pale pits at their bases. Dorsolateral setae long and slender, all arising from large pale pits, 4, 5 or 6 on each side. Scutellum with 4 or 6 setae in a row, all long and slender. Pre-alar setae only 2 on each side.

Wing in Fig. 81-D. Squama bare. Wing membrane slightly purple, without dark marks, finely granular under high power magnifications. R 2+3 separated both from R 1 and R 4+5, ending about midway between the two ends. Costa not extening beyond end of R 4+5, which is situated far distal of end of Cu 1. fCu almost under r-m. Cu 2 strongly sinuate. Anal vein extending much beyond fCu. Legs uniformly dark brown. Front tibia with a long terminal spur (Fig. 81-F). Middle tibia with two short terminal spurs (Fig. 81-G). Hind tibia with a long terminal spur, a short terminal spur, and a terminal comb composed of some 12 free spines (Figs. 81-H, I).

Distribution of setae on abdominal tergites in Fig. 82-E. Hypopygium in Figs. 82-A, B. Ninth tergite nearly quadrangular, posterior margin almost straight, with short and stout setae along posterior margin. Anal point with a small tubercle bearing a terminal seta. Inner lobe of gonocoxite long, finger-like, covered with

numerous microtrichiae, and with about 10 short setae in the apical portion (Fig. 82-E). Gonostylus forked into two branches of subequal length, with numerous microtrichiae on the basal portion, the inner and dorsal branch without setae, and the lateral and ventral branch bearing several setae on the dorsal side (Figs. 82-C, D).

Remarks. The present species is diagnosed as a member of *Diplocladius* Kieffer (1908), since eyes are pubescent, squama bare, wing without macrotrichiae, fCu under r-m, Cu2 sinuate, and gonostylus being forked into two arms. A single species, *D. cultriger* Kieffer, 1908, is known from Europe. The present specimens are regarded as belonging to the same species, although the values of AR are conspicuously different (3.0 in the European population according to Edwards, 1928, 1.68-1.91 in our specimens), and in the shape of gonostylus as illustrated by Pinder (1978, Fig. 104C). *D. cultriger* was recorded also by Tokunaga (1964) from Nagaoka, Niigata, in which AR was recorded as 2.35.

(35) *Parametriocnemus chuzedecimus*, sp. nov.

Materials studied. 10 males and 2 females emerged from sample A and B of Lake Chuzenji, both collected at profundal zones, but none from littoral zones. They were all dissected and mounted, some after fixed on pin for observation of body coloration (Holotype, male, A 48:11; paratypes: A 48: 12—22). 7 pupal and 4 larval exuviae associated with the adults were also recovered and mounted.

Male. Body length 4.33—5.27 mm (4.70 mm in average of 7), wing length 2.60 - 2.73mm (2.66mm). Antennal hairs and shaft brown; ground color of scutum brown, scutal stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites dark brown; halteres brownish yellow; leg segments almost uniformly dark brown.

Head in Fig. 83-A. Eyes bare, with a conspicuous dorsomedial projection, ER 0.62 —0.76 (0.70 in average of 6). Antenna with 13 flagellar segments, AR 1.63 1.82 (1.73 in 7), apex of terminal segment only slightly swollen. Palp 4 segmented (65, 182, 144, 177 microns) ; second segment slightly longer than fourth segment. Supraorbital setae 12—18 (15.0 in average). Clypeal setae 8 12 (most frequently 10).

Antepronotum with 6—10 (most frequently 8) lateral setae on each side. Scutum without dorsomedian setae, 11 21 (16.3 in average) dorsolateral setae and 6—8 (most frequently 8) pre-alar setae on both sides. Scutellum with 10 18 (14.4) setae. Squama with 22—41 (31.9) fringe setae. Wing venation and distribution of macrotrichiae in Fig. 83-F. Wing membrane with macrotrichiae on distal 2/3 of cell between R 4+5 and M, on veins R 1, R 4 +5 and M, and near wing margin between veins M and Cu 2. R 2 + 3 separated, and ending about midway between ends of R 1 and R 4+5. Cu 1 ending proximal of end of R 4+5. Costa not extending beyond end of R 4+5. Cu 2 strongly sinuate.

LR1 0.88 -0.92 (0.90 in average, unusually high as Orthocladiinae), LR2 0.54 0.56 (0.55), LR3 0.62—0.65 (0.63). Tarsi with medium sized beards, BR1 1.8—5.2, BR2 3.2 5.4, BR3 4.5 6.1. Front tibia with a long terminal spur (76 microns Fig. 83-H), middle tibia with two short terminal spurs (both 35 microns, Fig. 83-I), hind tibia with a long terminal spur (83 microns), a short terminal spur (27 microns), and a terminal comb composed of some 15 free spurs 35 64 microns long (Fig. 83-J). Tarsi without terminal spurs. Pulvilli absent, empodium small (Fig. 83-K).

Abdominal tergites with relatively large numbers of setae which are almost evenly distributed. Hypopygium in Figs. 84-A, B. Ninth tergite with several long lateral setae on both sides, 2 or 3 pairs of short setae on posterior margin near base of anal point, and numerous microtrichiae. Anal point roughly triangular, widest at base and apically pointed, bears several short lateral hairs and thickly covered by microtrichiae. Ninth tergite has a pair of darkly pigmented lobes on both sides of anal point. Inner lobe of gonocoxite semiglobular and bears numerous strong setae. Gonostylus widest at apex and tapering towards base, apically truncate and with a large apical spine, and a prominent tooth-like subapical projection on inner side.

Female (examination of two dissected females). Body length 3.13, 2.83 mm, wing length 2.00, 1.83mm. Body coloration similar to that of male but generally paler; ground color of scutum yellowish brown, scutal stripes dark brown, scutellum brown, postnotum dark brown, abdominal tergites dark brown ; leg segments brown to dark brown ; halteres stem brown, knob yellow.

Head in Fig. 83-C. Eyes bare, with conspicuous dorsomedial projection, ER 0.71. Antenna with 5 flagellar segments (Fig. 83-D). Supraorbital setae 12 or 13, clypeal setae 13 or 14. Lateral pronotal setae 7 or 8 on one side. Scutum with 14 well developed dorsomedian setae (these are absent in male), 24 or 25 dorsolateral setae and 7 or 8 pre-alar setae on both sides. Wing in Fig. 83-G, covered much more densely with macrotrichiae than in male. Squama with 25—26 fringe setae. LR1 0.83 in both specimens, LR2 0.52, 0.54, LR3 0.62, 0.64; Tarsus V of front leg 0.15 or 0.16 times the length of front tibia; BR1 2.7, 2.9, BR2 3.0, 3.2, BR3 3.4, 3.6. Pulvilli absent. Spermathecae two, both small, 58×42, 54×26 microns (Fig. 83-L). Cercus short and wide, ear-shaped, 50 microns long and 97 microns wide (Fig. 83-M).

Pupa. Length of abdomen 3.52—4.54mm (4.01 mm in average of 6). Thoracic respiratory organs horn-like, 320—464 microns long (405 microns in average of 14), apically pointed and with numerous small spines on the shaft (Figs. 84-C, D). Distribution of spines, spinules and hairs on abdominal tergites in Fig. 85-A. Abdominal segments I to V with W-shaped pigmented and thickened lines along posterior margin. Tergites II to VI with a proximal band of spinulous area (-a), large central spinose area (-b) composed of small spines, and a wider caudal spinose area composed of larger spines (-c), which are all contiguous. In addition, tergites II to IV with a band of recurved spines along posterior margin (-d) which are arranged in about 4 rows in central zone. Tergites VII and VIII with a pair of proximal spinulous areas, and a middle spinulous area. Abdominal segment VIII with a row of large pigmented spines along posterior margin (Fig. 85-K). Abdominal segments II to VI with 3 pairs of short and simple lateral hairs (sss), VII with 3 pairs and VIII with 5 pairs of long, flat and filamentous hairs (LLL and LLLLL). Anal fins (Fig. 84-E) with 18—25 (21.8 in average of 14) long, filamentous fringe hairs, and 3 long, rather rigid terminal setae which are subequal in length (240—320 microns in length, 290 microns in average).

Larva (observation of 4 larval exuviae associated with papae and adults). Labial plate about 160 microns wide and 110 microns long, with 11 teeth all highly pigmented, the central tooth unpaired and widest (Fig. 85-P). Mandible 155 microns long, with 5 cutting teeth (Fig. 85-Q). Maxilla in Fig. 85-L, epipharynx Fig. 85-N, setae on labrum in Fig. 85-M. Antenna composed of only 4 segments (65, 35, 20, 10 microns), terminal segment narrow and sharply pointed; antennal blade 86 microns long and longer than combined length of segments II to IV (Fig. 85-Q). Preanal hair tuft each with 7 long hairs, their base half-globular, 40 microns high and 34 microns in diameter (Fig. 85-S).

Remarks. This species is considered as a member of genus *Parametriocnemus* Goetghebuer, since wings with macrotrichiae, gonostylus being simple, eyes bare, Cu 2 strongly bent, anal point well developed, and R 4+5 ending distal of tip of Cu 1. According to Brundin (1956), 2 species of this genus were recorded from Europe, *P. stylatus* (Kieffer) and *P. boreophilus* (Gowin). Gowin & Thienemann (1942) found that pupa of the first species bears fringe hairs on anal fins such as seen also in the present species, while they are absent in pupa of the latter. Sublette & Sublette (1973) recorded in their catalogue of Chironomidae in the Oriental Region that species described by Kieffer (1911) with a name of *Metriocnemus fusiger* is a member of this genus. Sasa (1981 a) recorded a species of this genus from Minamiasakawa River, gave morphological accounts on male, female, pupa and larva, and diagnosed it as *P. stylatus,* since no clearcut differences could be found from its descriptions presented by the authors from Europe.

This species can be easily differentiated in male from *P.stylatus* of Sasa (1981) by the body size (wing length 1.34 -1.42 in *stylatus* vs. 2.60—2.73 in this spcies), by AR (0. 79—0.95 vs. 1.63 - 1.82), by the density and distribution of macrotrichiae on wing (less hairy and restricted on distal half in this species), by wing venation (vein costa extending beyond end of R 4+5 in *stylatus*, costa not extending and R 4+5 ending distal of Cu 1 in this species), by LR1 (unusually high in this species), and by the shape and structure of anal point (lateral hairs longer in this species), inner lobe of gonocoxite (with more rounded posterior corner in this species), and gonostylus (apically more expanded and truncate in this species).

In pupa, this spcies is characteristic as a member of genus *Parametriocnemus* in that anal fins bear long filamentous fringe hairs in addition to three hook-like terminal setae, the transverse band of large recurved spines along posterior margin of abdominal tergite II which is present in most other chironomid pupae is absent and replaced by a band of multiple rows of small recurved spines such as seen in tergites III and IV, and it has a row of large, pigmented spines along posterior margin of abdominal segment VIII (Fig. 85-K). Pupa of the present species differs from that of *P. stylatus* described by Sasa (1981a, p. 27) from the River Minamiasakawa in that the size of abdomen and of thoracic respiratory organs are much larger, thoracic respiratory organs are spinose, terminal band of large pigmented spines is seen only on abdominal segment VIII (on V to VIII in *stylatus*), lateral setae on segment VII and VIII are long and filamentous (all simple in *stylatus*), and fring setae on anal fins are more numerous (only 6—8 in *stylatus*, 18 25 in the present species).

In hava, this species differs from *stylatus* of Sasa (1981) in the number of teeth of labial plate (12 versus 11), and in the number of segments of antenna (5 versus 4).

(36) *Limnophyes tamakireides* Sasa, 1983

Materials studied. 2 males and 2 females emerged from sample B 10, collected from a small stream running into Lake Chuzenji (Specimen No. A 51:91, 92).

Male. As described and illustrated by Sasa (1983, p. 78 and Fig. 28). Very small midge with wing length of 0.95—1.00 mm. Body almost uniformly black. Head in Fig. 86-J. Eyes bare, elongate oval and without dorsomedial projection, ER 1.25. Antenna composed of only 12 flagellar segments, AR small, 0.31—0.32. Antennal hairs short, AHR 0.26 0.28. Scutum without dorsomedian setae, but with as many as 64—70 dorsolateral setae, some of which are expanded in the middle; pre-alar setae 7 or 8

in one side. Scutellum with 6 or 8 setae in a transverse row. Antepronotum with 4 or 5 upper group of setae and 4 or 5 lower group or lateral setae (Fig. 86-K). Wing membrane coarsely granular. Squama with 5 or 6 fringe setae. Anal lobe flat. R 2+3 separated from R 1 and R 4+5, ending closer to end of former vein. Costa extending much beyond end of R 4+5. fCu much beyond r-m. Cu 2 strongly curved. Front tarsus I short, LR1 0.45 or 0.46, LR2 0.43—0.44, LR3 0.54—0.56. Tarsi without long beards, BR1 2.2. Pulvilli absent.

Hypopygium in Fig. 86-L. Anal point absent, ninth tergite without long setae in the middle. Gonocoxite with a small conical inner lobe. Gonostylus quite unusual in shape and structure, basal half swollen and with convex inner margin, apical half tapering towards apex and curved inwards, without neither apical spur nor subapical tooth, bearing several long setae along inner margin.

Female. Body length 1.93, 2.00 mm. Wing length 0.97, 1.01 mm. Body coloration as in male, almost uniformly dark brown, including halteres. Head in Fig. 86-A. Eyes bare, reniform, widely separated from each other, ER 1.16. Supraorbital setae 5 or 6 on each side, clypeal setae 30, 33. Antepronotum with 3 or 4 upper setae, and 4 or 5 lower (lateral) setae. Dorsomedian setae absent, dorsolateral setae 46, 48 and 53, 55, some being expanded in the middle, others simple (Figs. 86-B, C). Pre-alar setae 7 or 8. Scutellum with 8 or 10 setae in a transverse row. Squama with 5 fringe setae. Wing membrane coarsely dotted. Wing venation as in male. LR1 0.48, 0.49; LR2 0.40, 0.42; LR3 0.51, 0.52, all unusually small. Front tarsus V 0.13, 0.14 times the length of front tibia. BR1 2.3, 2.4; BR2 2.3, 2.4; BR3 2.5, 2.6. Spermathecae in Fig. 86-H, cercus in Fig. 86-I. Terminal spurs of tibiae in Figs. 86-D, E, F, G.

Remarks. This species was described first by Sasa (1983) by males reared from bottom samples of a small stream running into Lake Okutama. The males collected this time in Nikko are morphologically almost identical to the type specimens. Morphology of the female is a new record.

(37) *Smittia sainokoensis,* sp. nov.

Materials studied. 6 males and a female were collected on the shore of Lake Sainoko, 7 May 1981, with a sucking tube while they were resting on a wall. All dissected and mounted on slides (Specimen No. A 50:01—06). A male was collected also on the shore of Lake Chuzenji, 8 May 1981 (No. A 50:07).

Male. Body length 1.88—2.65 mm (2.40 mm in average of 7). Wing length 1.55—1.87 mm (1.69 mm). Body coloration almost entirely black or dark brown; ground color of scutum black and pruinose, scutal stripes shining black, scutellum dark brown, postnotum and abdominal tergites black, halteres brownish yellow, leg segments dark brown, wing membrane milky white.

Antenna with 13 flagellar segments as usual, last segment with a distinct apical seta about 60 microns long (Fig. 87-B). AR 1.89—2.38 (2.16 in average of 7). AHR 0.56—0.75. Eyes pubescent, with concave inner margin, ER 1.03—1.18. Supraorbital setae 8—14, clypeal setae 6—8. Scutum with 6—10 dorsomedian setae, 17—30 dorsolateral setae in double or triple rows, and 6—12 pre-alar setae (Fig. 87-E). Scutellum with 16—26 setae in double rows. Squama bare. Wing in Fig. 87-C. Wing membrane bare but finely granulated, brownish in color. R 2+3 separated from R 1 and R 4+5. Costa extending beyond end of R 4+5. fCu much beyond r-m, Cu 2 strongly curved. Front

tibia with a long terminal spur 63 microns long, middle tibia with two short terminal spurs 22 and 27 microns long, hind tibia with a long spur (64 microns), a short spur (22 microns), and a comb composed of 11 free spurs 24 to 38 microns long. Other leg segments without terminal spurs. LR1 (front leg ratio) unusually small, 0.52—0.62; LR2 also very small, 0.40—0.47; LR3 0.53—0.60. Tarsi with long beards, BR1 3.7—6.9, LR2 5.0—6.4, LR3 10.9—11.8. Pulvilli absent.

Hypopygium in Fig. 87-I. Anal point long, slender, widest at base and with rounded apex, about 130 microns long and 22 microns wide at the base, with numerous short hairs (or unusually large microtrichiae) on its basal half. Ninth tergite with 4—6 setae on both sides of the base of anal point. Gonocoxite nearly conical, with a small finger-like inner lobe, and several rigid setae arising from elevated bases along inner margin. Gonostylus quite unusual in structure, with a beak-like apical process, a large spatulate subapical spur, and a large conical subapical tooth on inner margin.

Female. Body length 2.27mm, wing length 1.40 mm. Coloration as in male, almost uniformly dark brown, halteres brownish yellow. Head in Fig. 87-A. Eyes pubescent and reniform, inner margin slightly concave, ER 1.00. Antenna composed of a pedicel and 5 flagellar segments, flagellar segments II to IV nearly globular, last segment short and oval. Supraorbital setae 8 on each side. Clypeal setae 6. Thorax in Fig. 87-F. Antepronotum with 5 lateral setae. Dorsomedian setae of scutum 15, all minute and arising from small pale pits. Dorsolateral setae well developed, 39 on each side. Pre-alar setae 14 and 15. Scutellar setae 22 in double rows. Squama bare. Wing membrane finely granular, purplish. Wing venation in Fig. 87-D. Structure of legs as in male. LR1 0.47, LR2 0.43, LR3 0.56. Front tarsus V 0.15 times the length of front tibia. Tarsi without long beards, BR1 2.3, BR2 2.4, BR3 2.8. Spermathecae (Fig. 87-G) dark brown, both oval, one 58 microns long and 42 microns wide, another 72 microns long and 52 microns wide. Cercus (Fig. 87-H) almost circular (not ear-shaped as in most other Orthocladiinae), 58 microns long and 54 microns wide.

Remarks. Specimens of this species were collected only by adults resting on the shore of Lakes Sainoko and Chuzenji, and their breeding sites and immature stages are yet unknown. The male is morphologically diagnosed as a member of genus *Smittia* Holmgren, as redefined by Brundin (1956), since squama bare, wing finely granulate, Cu 2 strongly curved, anal vein extending beyond fCu and curved downwamds, costa extending much beyond end of R 4+5, fCu much beyond r-m, antenna with a strong terminal seta, eyes pubescent, pulvilli absent, and anal point being long, slender and without lateral hairs. This genus is very rich in the number of species, and Goetghebuer (1940) recorded over 80 species from the Palaearctic Region. Morphologically the present species is somewhat related to *S. nudipennis* (Goetghebuer, 1913) in that eyes are pubescent, gonostylus with a conspicuous subapical lobe, anal point long and with microtrichiae on basal half only, and vein R 4+5 ending proximal to tip of Cu 1. However, the present species differs from *nudipennis* in AR being much larger (1.0—1.2 in *nudipennis* according to Pinder, 1978), in the shape of inner lobe of gonocoxite (broad and rectangular in *nudipennis*, narrow and finger-like in the present species), and in the shape of supraapical lobe of gonostylus (broad and obtuse in *nudipennis*, narrow and angulate in the present species); the shape of anal lobe of wing is also quite different, flat in *nudipennis* but rectangularly produced in the present species. Among 11 species of *Smittia* reported from Micronesia by Tokunaga (1964), *S. brevicornis* Tokunaga is the only one with pubescent eyes, but it has no anal point. Altogether 10 species of genus *Smittia* were

recorded also by Tokunaga (1936, 1939, 1940) from Japan and neighboring regions (including Taiwan and Sakhalin), among which *S. niitakana* (Tokunaga, 1939) is somewhat related to the present species in that eyes are pubescent, AR about 2.1, anal point present, and gonostylus with an apical projection, but the present species differs from it in that anal point is much larger, and gonostylus bears a long apical process and a conspicuous subapical tooth which are not seen in other species of this genus.

(38) *Epoicocladius chuzeundecimus*, sp. nov.

Materials studied. 2 males and a female, emerged from sample B 8 collected in a littoral zone of Lake Chuzenji 8 May 1981. All dissected and mounted on slides (No. 51:75, 76).

Male. Body length 2.11—2.20 mm, wing length 1.34 −1.43 mm. Body coloration largely brown or dark brown, i.e. ground color of scutum brown, scutal stripes and postnotum dark brown, scutellum brown, leg segments almost uniformly yellowish brown, halteres yellow, wing unmarked and milky white, abdominal tergites brown. Head in Fig. 88-A. Antenna with 13 flagellar segments as usual, AR 0.67—0.69. Eyes bare, inner margin almost straight and widely apart from each other, ER 1.31—1.42. Supraorobital setae 4 on both sides. Clypeal setae 4 in both specimens. Thorax in Fig. 89-C. Antepronotum with 3 or 4 lateral setae. Scutum without dorsomedian setae, dorsolateral setae 4 to 6 on each side, pre-alar setae 3 in both sides of the two specimens. Scutellum with only 2 setae closely set. Wing in Fig. 89-A. Squama bare. Anal lobe rather conspicuous. Cu 2 strongly sinuate. R 2+3 separated from both R 4+5 and R 1, ending about midway between the two ends. Tip of R 4+5 above tip of Cu 1. Anal vein extending beyond fCu. Tips of front, middle and hind tibiae in Figs. 89-G,H,I. Pulvilli absent.

Hypopygium in Figs. 88-C, D. Ninth tergite with a small triangular anal point, and a transverse row of 8 or 9 short setae behind its base (Fig. 88-E). Gonocoxite with a broad, setigerous inner lobe (Fig. 88-F). Gonostylus apically expanded and curved inwards, with a large apical blade.

Female. Body coloration generally more yellowish than in male. Ground color of scutum yellow, scutal tripes brown, scutellum yellow, postnotum brown, abdominal tergites yellowish brown, leg segments yellowish brown. Body length 1.89 mm, wing length 1.29 mm. Head in Fig. 89-E. Eyes bare, reniform, inner margin only slightly concave, widely apart from each other, ER 1.56. Antenna with 5 flagellar segments, palp 4 segmented. Supraorbital setae 4 on each side. Clypeal setae 5. Thorax in Fig. 89-D. Antepronotum with 2 lateral setae. Scutum without dorsomedian setae, 7 or 8 dorsolateral setae, and 3 pre-alar setae on each side. Scutellum with only 2 setae. Spermathecae dark brown, small in size, 43×26 microns, 49×25 microns (Fig. 89-J). Cercus very long and narrow (Fig. 89-K).

Remarks. This species is judges as belonging to genus *Epoicocladius* Zavrel, since eyes, squama and wing membrane all bare, AR smaller than 1, vein Cu 2 strongly curved, R 2+3 separated both from R 1 and R 4+5 and ending about midway between the two veins, tip of R 4+5 almost above tip of Cu 1, anal vein extending beyond fCu, costa produced beyond tip of R 4+5, and the structure of leg segments as usual. Only one species has been known within this genus, *E. ephemerae* (Kieffer) of Zavrel (1924) and of Edwards (1929), which is however a synonym of *E. flavens* (Malloch) according

to Pinder (1978). The present species is similar in the structure of inner lobe of gonocoxite, but anal point of the present species is smaller, and the shape of gonostylus is quite different between the two species (apically expanded and curved inwards in the present species, simple and parallel-sided in *flavens*).

(39) *Thienemanniella chuzeduodecimus*, sp. nov.

Materials studied. 4 males emerged from sample B 10, collected from a small stream on the bank of Lake Chuzenji, all dissected and mounted in gum-chloral (Specimens No. 51:96, 97)

Male. Body length 1.23—1.37 mm (1.30 mm in average of 4), wing length 0.64—0.71 mm (0.67 mm). Body largely brown or yellow, i.e. antennal shaft and hairs brown, ground color of scutum yellow, scutal stripes and postnotum dark brown, scutellum brown, abdominal tergites yellowish brown, halteres yellow, leg segments brown. Head in Fig. 90-A. Eyes pubescent, reniform and with concave inner margin, ER 1.30—1.52 (1.40 in average). Antenna with only 8 flagellar segments, last segment short, as long as preceding 3 segments combined, AR 0.46—0.48 (0.47 in average). Antennal hairs relatively short, AHR 0.36—0.38 (0.37 in average). Supraorbital setae absent, clypeal setae 6 in a transverse row. Dorsal view of thorax in Fig. 90-G. Antepronotum with 1 or 2 lateral setae. Scutum without dorsomedian setae, with 7—10 (8.8 in average) dorsolateral setae, and 3 pre-alar setae on each side. Scutellar setae only 2. Wing in Fig. 90-B. Vein R 1 and R 4+5 short and fused with thickened costa. fCu much beyond tip of R. Anal vein ending proximal to fCu. Anal lobe flat. Squama bare. LR1 0.72—0.76 (0.74), LR2 0.61—0.65 (0.63), LR3 0.63—0.67 (0.65). Front tibia with a long terminal spur (Fig. 90-C). Middle tibia with two short terminal spurs (Fig. 85-D). Hind tibia with a long terminal spur, a short terminal spur, and a terminal comb composed of 12 free spurs (Fig. 90-E). Hind tibia nearly cylindrical. Front tarsus V 0.12—0.13 times as long as front tibia, and longer than front tarsus IV (Fig. 90-F). Pulvilli absent. Hypopygium in Figs. 90-H, I. Anal point absent, ninth tergite with only 1 or 2 long seta. Inner lobe of gonocoxite flat, posterior margin nearly rectangular, bearing short setae. Gonostylus simple, roughly cylindrical, with a strong terminal spur.

Remarks. This species is a member of genus *Thienemanniella* Kieffer, since veins R 1 and R 4+5 are fused with thickened costa, wing bare and anal lobe flat, anal point absent, and hind tibia being cylindrical. Among the known species of this genus, it resembles to *T. majuscula* Edwards, 1924, in that eyes are pubsecent, and inner lobe of gonocoxite being broad and ending almost rectangularly. However, the present species is quite unique in that antenna composed of only 8 flagellar segments, and last segment only as long as the preceding 3 segments combined, and anal tergite with only 1 or 2 long seta. It is also somewhat related to *T. morosa* Edwards, 1924, in that last segment of antenna is short and inner lobe of gonocoxite is ending rather abruptly, but differ essentially in body coloration (entirely black in *morosa*) and in the number of antennal segments (13 segmented in *morosa*, though the division between the last two segments may be incomplete, according to Edwards, 1929). Of 4 species of *Thienemanniella* described by Tokunaga (1936) from Japan, *T. majuscula* Edwards is the only species with pubescent eyes, such as seen in the present species, but both differ in the structure of antenna, as discussed previously.

(40) *Prodiamesa* sp.

Materials studied. 2 males and a female, emerged from bottom samples of Lake Chuzenji collected in 1979 and 1981. A pupal skin associated with the male, and 2 larvae recovered from the same sample (Specimens No. A. 52:01 -06).

Male. Body length 6.43, 7.35 mm, wing length 3.23, 4.10 mm. Body entirely black, scutum shining black and stripes hardly discernible, scutellum, postnotum and abdominal tergites all black. Leg segments dark brown.

Head in Fig. 91-A. Eyes bare, with a long dorsomedial proejction, ER 0.51, 0.54. Antenna with 13 flagellar segments, AR 2.68, 2.85, antennal hairs long, AHR 0.49, 0.61. Supraorbital setae 12—16, clypeal setae 14, 16. Palp 4 segmented, penultimate segment not toothed. Antepronotum well developed, with 6—8 lateral setae. Thorax in Fig. 93-A. Scutum without dorsomedian setae, with 12 14 dorsolateral setae on both sides, and 5 to 10 pre-alar setae on both sides. Scutellum with 30 setae in both specimens. Wing in Fig. 91-B. Squama with 37—40 fringe setae. Wing membrane without macrotrichiae but finely granulated with microtrichiae, slightly purplish. R 2+3 separated from R 1 and R 4+5, ending about midway between ends of the two veins. Costa extending beyond end of R 4+5. fCu distal to m-cu, and slightly proximal to r-m. LR1 0.81, 0.83; LR2 0.49, 0.50; LR3 0.56, 0.58. Front tinia with a long terminal spur 120 microns long (Fig. 91-C). Middle tibia with two short, stout and barbed terminal spurs (Fig. 91-D). Hind tibia with a long and barbed terminal spur, a short and barbed terminal spur, and a group of dark spurs distributed in the subterminal area (Fig. 91-G). Front tarsi without terminal spurs, middle and hind tarsi I and II each with two short terminal spurs (Figs. 91-E, F), other tarsal segments without terminal spurs. Front tarsus V 0.13 or 0.14 times as long as front tibia, Pulvilli absent, claws and empodium well developed (Fig. 91-H).

Hypopygium in Figs. 92-A,B. Anal point widest at base and tapering towards apex, with microtrichiae on basal half; ninth tergite with short setae on both sides of the base of anal point (Fig. 92-C). Gonocoxite with three appendages on inner margin, a dorsal setigerous and triangular appendage (Fig. 92-E), a flat, setigerous and elongate ventral appendage (Fig. 92-F), and a long, dark and sharply pointed spur arising from elevated base (Fig. 92-G). Gonostylus nearly parallel-sided and with concave inner margin, the terminal spur being dark, stout, and spatulated. (Fig. 92-D).

Female. Body length 5.02 mm, wing length 3.75mm. Body coloration as in male, almost uniformly black. Ground color of scutum dark brown, scutal stripes shining black, scutellum dark brown, postnotum black, abdominal tergites all black, leg segments all black or dark brown. Head in Fig. 91-I. Eyes bare, with a conspicuous dorsomedial projection, ER 0.72. Supraorbital setae 12 on both sides, clypeal setae 22. Antenna composed of a pedicel and 5 flagellar segments. Palp with 4 flagellar segments. Antepronotum with 15 or 16 lateral setae (Fig. 93-C). Dorsomedian setae of scutum absent as in male, dorsolateral setae 18 and 20, pre-alar setae 7 and 8, scutellar setae 42 (Fig. 93-B). Wing venation as in male. Squama with 37 and 44 fringe setae. m-cu proximal to fCu, which is almost under r-m. LR1 0.81, LR2 0.49, LR3 0.56, all nearly the same as in male. Distribution of spurs on tibiae and tarsi as in male. Front tarsus V 0.13 times as long as front tibia. BR1 2.3, BR2 2.3, BR3 2.9. Spermathecae 3, all dark, nearly globular and subequal in size, 100×110 microns, 100×120 microns, 105 × 110 microns (Fig. 91-J). Cercus in Fig. 91-K.

Pupa. Length of abdomen 7.45 mm. Color of pupal skin conspicuously brown.

Thoracic respiratory organs tube-like, nearly parallel-sided but with pointed apex, with numerous spines on the basal portion and along inner surface (Fig. 94-A). Distribution of spines and hairs on abdominal tergites in Figs. 94-B, C. Tergite I without spines. II with an oral spinulous area (II-a), a W-shaped central spinose area with very small spines (II-b), a third band of large to medium-sized conical spines (II-c), and a candal band of orally directed, sharply pointed spines distributed in multiple rows (II-d). Tergites III and IV also with the above 4 zones of spinose areas of similar structures. In tergites V and VI, the caudal band (-d) is interrupted in the middle and the spines being much smaller. Tergites VII and VIII without spinose areas but with spinulous zones as in Fig. 94-C. Segments I with 3 pairs, II to VIII with 4 pairs of lateral hairs, among which those on I to VI are simple, and those on VII and VIII are long and branched (Fig. 94-H). Segment II with a pair of brush-like spine groups in the caudolateral corners (Fig. 94-F). Caudal 1/3 of lateral margins of segment IV, and entire length of lateral margins of segments V to VIII with numerous brush-like hairs (Figs. 94-B,C,H). Sternites IV, V and VI with whirl-like spinose areas in the caudolateral corners (Fig. 94-G). Anal fins with numerous filamentous hairs, 175 on left and 187 on right side.

Larva. The following characters are based on examination of two larvae presumably of the present species collected from bottom sediment of Lake Chuzenji 8 May 1981. Body length 12.2 and 13.2 mm, head capsule 875×713, 1,000×763 microns, all measured in mounted specimens. Antenna with only two segments (the distal segments possibly lost from all the specimens: Fig. 93-D). Mandible 140 micorns long and 85 microns wide, with 4 teeth, the first tooth long, wide and apically pointed, nearly as wide as the rest 3 teeth combined (Fig. 93-E). Labial plate 115 microns long and 150 microns wide, recessed and less pigmented in the middle, with 6 paris of lateral teeth; paralabial plates attached to both ends of labial plate, 80 microns long and 20 microns wide, with several subapical hairs (Fig. 93-F). Labrum and epipharynx in Fig. 93-G. Anterior pseudopods with numerous claws (Fig. 93-H). Preanal hair tufts composed of 8 long hairs and 2 shorter hairs at base, arising from subsylindrical base (Figs. 93-I,J). Anal segment in Fig. 93-I, with 4 anal gills, and a pair of posterior pseudopods each bearing 16 claws (Fig. 93-K).

Remarks. This species is regarded as belonging to genus *Prodiamesa* Kieffer, since cross vein m-cu present and located proximal to fCu, R 2 + 3 present and simple, wing membrane bare, and base of gonocoxite bearing darkly chitinized elengate appendages arising from elevated bases. Among known species of this genus, it is most closely related to *rufovittata* Goetghebuer, since gonostylus is simple, anal point is present and robust, and gonocoxite bearing pad-like dorsal and ventral appendages, as described and illustrated by Pinder (1978). However, the present species differs obviously from it in the shape and structure of gonostylus and the dorsal and ventral appendages of gonocoxite, as well as in the shape and distribution of setae on ninth tergite. Among species of Diamesinae (including Prodiamesinae in the present sense) reported by Tokunaga (1936, 1937) from Japan, the present species is most closely allied to that described by male by the name of *Prodiamesa (Monodiamesa) bathyphyla* Kieffer in the value of AR, in body coloration and in the structure of hypopygium, but again differs remarkably from that redescribed in detail by Pinder (1978) from Europe in the shape and structure of various parts of hypopygium, especially in that anal point is much shorter and stouter, and gonostylus is wider and with many setae on inner surface in the present species. The structure of labial plates of the larva of present

species is characteristic and similar to those illustrated by Oliver et al. (1978, Figs. 200, 201) as that of *Monodiamesa bathyphila*. The structure of pupa, especially the distribution of spines and lateral setae on abdominal tergites, are characteristic to this species not seen in all other pupae known from Japan.

(41) *Syndiamesa* sp.

Materials studied. A male, collected on the shore of Lake Chuzenji 8 May 1981 on the wall of a boat house. Dissected and mounted (Specimen No. A 52:11).

Male. Body length 6.13 mm, wing length 3.69 mm. Body coloration almost uniformly black, with the exception of halteres which are largely yellow. Antenna with 13 flagellar segments, AR 2.37, last segment with a terminal seta 40 microns long. Antennal hairs long, AHR 0.57. Palp with 4 flagellar segments, 160, 272, 360, 376 microns long. Eyes bare, strongly produced medially, ER 0.55. Supraorbital setae 46, 48. Clypeal setae 24. Antepronotum with 8 lateral setae on each side. Dorsomedian setae of scutum highly reduced, only 6 very minute hairs recognizable in about middle of scutum. Dorsolateral setae 26 on each side. Pre-alar setae 10 on each side. Scutum with 40 setae in multiple rows. Wing in Fig. 95-A. Squama with 32 fringe setae. Anal lobe strongly produced. Wing membrane bare, finely granular. R 2+3 separated from R 1 and R 4+5, ending slightly closer to end of the latter. Cross vein m-cu situated proximal to fCu. Costa produced much beyond end of R 4+5. Cu 2 strongly curved downwards. LR1 0.65, LR2 0.50, LR3 0.63. Front tibia with a long and barbed apical spur 136 microns long (Fig. 95-E). Middle tibia with two long and barbed apical spurs 112 and 116 microns long (Fig. 95-F). Hind tibia with two long and barbed apical spurs 112 and 124 microns long, a terminal comb composed of 12 free spurs 32—56 microns long, and numerous dark spurs distributed almost the entire length of hind tibia on its inner side (Fig. 95-G). Front tarsus I with two simple and short terminal spurs, II and III each with one short terminal spur. Tarsi I, II and III of middle and hind legs each with two short and simple terminal spurs (Figs. 95-H,I,J). Pulvilli absent, claws with several long hairs at base (Fig. 95-K). Tarsi with relatively long beards, BR1 6.2, BR2 5.6, BR3 4.9. Front tarsus V 0.12 times as long as front tibia. Length of tarsus IV and tarsus V being 260, 234 microns in the front leg, 189, 216 microns in the middle leg, 224, 240 microns in the hind leg.

Hypopygium in Fig. 95-L. Ninth tergite without anal point, and without long setae in the middle. Gonocoxite without inner lobes. Gonostylus simple, almost parallel-sided, inner margin concave, apical spur rather vestigial.

Remarks. This species is a member of genus *Syndiamesa* Kieffer of subfamily Diamesinae, since cross vein m-cu present and situated distal to fCu, R 2+3 present and simple, wing without macrotrichiae, eyes bare, tarsus IV of all legs not bilobed but cylindrical, antepronotum bare dorsally, and anal point absent. Among 5 species of this group reported by Tokunaga (1936, 1937) from Japan, the present specimen is closest to the description of *S. montana* Tokunaga in that tarsi I, II and III of middle and hind legs with terminal spurs, tarsus IV shorter than tarsus V in the middle and hind legs, and antepronotum with lateral hairs. However, the present specimen differs from it in that AR being much larger (1.7 in *montana*), anal point absent (with a short cylindrical anal point in *montana*), and gonocoxite without projection (small setigerous projection present on distomesal margin in *montana*). The scientific name of the present specimen is reserved therefore for future study.

SUMMARY

The chironomid species breeding in Lakes Yunoko and Chuzenji of the Nikko National Park, northern Kanto, were investigated by collection of adults on the lake shore and by laboratory rearing of bottom sediments collected at various depths. A total of 41 species belonging to subfamilies Chironominae, Orthocladiinae and Diamesinae were collected and identified, and the morphological characteristics of various stages were described and illustrated. Altogether 18 species among them were judged as new species, and several additional species were new to Japan. The chironomid species breeding in these lakes were frequently studied by previous workers, but the present study based mainly on the morphology of adult males and pupae have demonstrated that the previous studies based only on examination of larvae in the bottom sediments are rather meaningless. In the present study, remarkable differences were shown in the distribution of the chironomids between Lakes Yunoko and Chuzenji, the former being shallow and highly eutrophicated by introduction of sewage waters, and the latter being much larger, deeper, and less polluted.

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Note: References with * are described only in Japanese, and the titles were translated into English by the present author.

STANDARD MEASUREMENT DATA OF ADULT

	Microp-sectra yunoprima ♯01 (9)	*Microp-sectra chuze-prima* ♯02 (3)	*Microp-sectra chuze-quinta* ♯03 (3)	*Microp-sectra chuze-notescens* ♯04 (4)	*Tany tarsus yuno-secundus* ♯05 (3)	*Tany tarsus chuze-secundus* ♯06 (10)
BL (mm)	4 97–5 51 (5 26)	5 25–5.75 (5 41)	3 16–3 60 (3 40)	3 85–3 90 (3 87)	3 26 3 58 (3 38)	3 02 4 32 (3 56)
WL (mm)	3 74–4 07 (3 93)	2 97–3 16 (3 09)	2 16–2 26 (2 22)	1 93–2 28 (2 10)	2 07–2 18 (2 09)	2 19 2 71 (2 42)
AR	2 72–3 15 (2 87)	1 34–1 52 (1 45)	1 39 1 50 (1 46)	1 04 -1 76 (1 10)	1 13–1 17 (1 15)	0 98–1 13 (1 04)
AHR	0.58–0 76 (0 67)	0 36–0 47 (0 42)	0 48 0 55 (0 51)	0.51–0 54 (0 53)	0 52–0 60 (0 55)	0 46–0 54 (0 50)
ER	0 29–0 36 (0 32)	0 44 0 60 (0 52)	0 27 0 40 (0 35)	0.38 -0 47 (0 42)	0 73 1 02 (0 85)	0 62 0 83 (0 70)
so	15–18 (16 6)	15–16 (15 3)	14–18 (15 7)	12–14 (13 0)	10 (10)	8–12 (10 0)
cl	36 46 (40 8)	18–20 (18 7)	14–18 (15 7)	18–24 (21 0)	10–12 (11 0)	12–20 (15 3)
pn	0	0	0	0 (14.0)	0	0
dm	8 10 (9 2)	10 (10 0)	16–25 (19 7)	12 16 (9 0)	8 12 (10 0)	10–14 (11 8)
dl	14 16 (15 6)	10–12 (10 8)	8–12 (10 3)	8–10 (3 0)	6–8 (6 8)	6–8 (6 8)
pa	2 -4 (3 0)	2–3 (2 3)	2–5 (3 4)	2–4 (7 0)	1 (1)	1–2 (1 2)
sc	12 -16 (13 6)	8–10 (9 3)	10 (10)	6–8 (7 0)	6 – 10 (8 0)	2 4 (1 7)
sq	0	0	0	0	0	0
LR1	1 01 - 1 08 (1 05)	1 52 1.54 (1 53)	1 66–1 72 (1 68)	1 41–1.52 (1 48)	2 33–2 39 (2 36)	1 97 2 28 (2 06)
LR2	0.46–0 52 (0 49)	0 54 0 57 (0 55)	0 57–0 60 (0 58)	0 57 0 60 (0 59)	0 58 0 65 (0 62)	0 55–0 59 (0 57)
LR3	0 54–0 59 (0 57)	0 72–0 73 (0 72)	0 72–0 77 (0 74)	0 69–0 75 (0 71)	0 66–0 68 (0 67)	0 67–0 69 (0 68)
TR1	0 19 0 20 (0 20)	0 25–0 27 (0 26)	0 25 –0 26 (0 26)	0 26– 0 29 (0 28)	0 31–0 35 (0 33)	0 30–0 32 (0 31)
BR1	10 1–12 0 (11 1)	4 0 4 2 (4 1)	3 7–4 5 (4 1)	4 0 4 3 (4 2)	3 6–5 0 (4 1)	3 7–7 4 (4 4)
BR2	8 4–9 8 (9 1)	6 0 –7 3 (6.7)	6.3–7 8 (7 1)	5 3 –6 2 (6 8)	7.0–8 9 (8 0)	6 0–10 2 (7 8)
BR3	8 1 -8 6 (8 4)	6 6–7 6 (7.1)	5 6–6 8 (6 2)	5 9–6 6 (6 3)	8 0 8 4 (8 2)	5 4 6 7 (6 0)

MALES COLLECTED FROM THE NIKKO AREA

Tanytarsus gregarius ♯07 (8)	*Tanytarsus tamagotoi* ♯09 (4)	*Chironomus nipponesis* ♯10 (6)	*Dicrotendipes lobiger* ♯12 (10)	*Paracladopelma camptolabis* ♯13 (2)	*Demicryptochironomus chuzequartus* ♯14 (2)
3.27–4.33 (2.38)	3.26–3.80 (3.48)	8.32–9.03 (8.69)	4.69–6.15 (5.52)	4.32–4.34 (4.33)	4.98–6.34 (5.66)
2.00–2.93 (2.24)	2.07–2.16 (2.12)	3.67–4.74 (4.38)	2.52–3.07 (2.83)	2.34–2.45 (2.40)	3.27–3.40 (3.34)
1.14–1.39 (1.23)	1.04–1.12 (1.07)	3.24–4.10 (3.70)	2.29–2.62 (2.46)	2.05–2.07 (2.06)	2.76–2.82 (2.79)
0.49–0.57 (0.53)	0.49–0.54 (0.50)	0.56–0.68 (0.61)	0.54–0.61 (0.56)	0.54–0.55 (0.55)	0.54–0.57 (0.56)
0.64–0.81 (0.74)	0.61–0.76 (0.70)	0.21–0.37 (0.27)	0.35–0.38 (0.36)	0.25–0.34 (0.30)	0.27–0.29 (0.28)
10–15 (12.3)	8–9 (8.5)	24–41 (31.9)	21–25 (23.0)	15–16 (15.3)	17–18 (17.8)
12–18 (15.3)	10–14 (12.5)	30–50 (41.3)	16–23 (19.8)	12–14 (13.0)	16–19 (17.5)
0	0	0	0	7–8 (7.5)	10–16 (13.0)
10–18 (12.8)	6–8 (7.3)	16–26 (21.3)	10–14 (11.8)	14 (14.0)	18–27 (22.5)
7–12 (9.0)	5–9 (6.8)	20–50 (30.7)	12–16 (13.4)	8–11 (9.3)	16–20 (18.0)
1–2 (1.6)	1–2 (1.3)	6–9 (7.3)	4–6 (4.9)	3–5 (4.3)	6–9 (7.5)
6–10 (8.0)	2–4 (3.5)	32–50 (40.5)	8–15 (12.0)	9–10 (9.5)	30–32 (31.0)
0	0	25–42 (35.0)	9–11 (10.2)	4–8 (5.3)	15–16 (15.5)
1.74–1.89 (1.80)	1.92–2.17 (2.5)	1.34–1.56 (1.41)	1.48–1.65 (1.60)	1.81–1.90 (1.86)	1.50–1.60 (1.55)
0.55–0.56 (0.56)	0.56–0.58 (0.57)	0.57–0.61 (0.60)	0.52–0.56 (0.54)	0.59–0.61 (0.60)	0.60–0.64 (0.62)
0.65–0.69 (0.67)	0.67–0.69 (0.69)	0.68–0.70 (0.70)	0.62–0.64 (0.63)	0.69–0.70 (0.70)	0.63–0.65 (0.64)
0.24–0.26 (0.25)	0.28–0.30 (0.29)	0.21–0.24 (0.23)	0.19–0.22 (0.21)	0.25 (0.25)	0.22–0.25 (0.23)
3.5–4.9 (3.9)	4.0–4.4 (4.1)	1.8–2.5 (2.1)	2.3–3.3 (2.8)	3.0–3.4 (3.2)	2.3–2.7 (2.5)
6.1–8.4 (6.9)	4.3–4.7 (4.5)	2.2–3.3 (2.7)	3.0–4.6 (3.5)	5.6–5.7 (5.7)	3.1–3.2 (3.2)
6.3–8.3 (7.0)	5.5–6.7 (6.2)	3.2–4.7 (3.8)	4.2–6.2 (5.0)	5.7–6.0 (5.9)	3.2–4.6 (3.9)

STANDARD MEASUREMENT DATA OF ADULT

	Sticto-chironomus akizukii ♯15 (12)	*Sticto-chironomus multannu-latus* ♯16 (10)	*Phaenop-sectra kizaki-ensis* ♯17 (7)	*Poly pedilum nubecu-losum* ♯19 (9)	*Poly-pedilum asakawa-ense* ♯20 (4)	*Poly-pedilum tama-gohanum* ♯23 (5)
BL (mm)	5.07–6.74 (5.97)	4.35–5.25 (4.99)	6.56–7.66 (7.08)	5.07–6.25 (5.52)	3.90–4.66 (4.24)	3.57–3.83 (3.67)
WL (mm)	3.00–3.55 (3.41)	2.31–2.45 (2.36)	3.39–4.53 (3.91)	2.54–3.23 (2.96)	2.34–2.69 (2.45)	1.73–1.97 (1.83)
AR	1.89–2.21 (2.02)	1.58–1.81 (1.67)	2.26–2.53 (2.36)	1.80–2.16 (1.95)	1.80–1.98 (1.91)	1.22–1.30 (1.27)
AHR	0.51–0.63 (0.57)	0.50–0.54 (0.52)	0.57–0.71 (0.62)	0.53–0.61 (0.57)	0.39–0.59 (0.50)	0.46–0.50 (0.48)
ER	0.25–0.42 (0.36)	0.28–0.38 (0.35)	0.27–0.42 (0.36)	0.27–0.41 (0.32)	0.18–0.22 (0.20)	0.20–0.29 (0.24)
so	12–16 (14.5)	12–16 (14.2)	14–24 (19.0)	14–18 (15.7)	12–15 (14.0)	10–12 (11.5)
cl	22–32 (28.0)	18–24 (21.0)	30–42 (35.2)	28–37 (32.1)	23–32 (27.3)	16–21 (18.8)
pn	0 (0)	0* (0)	0 (0)	12–21 (18.1)	0 (0)	0 (0)
dm	20–23 (21.7)	14–20 (15.2)	10–22 (16.6)	18–22 (19.1)	12–15 (13.7)	12–16 (14.4)
dl	14–24 (17.2)	10–15 (12.4)	14–27 (19.6)	23–40 (27.1)	12–14 (13.0)	9–16 (12.7)
pa	5–9 (5.8)	4–7 (5.4)	5–8 (6.8)	8–16 (11.5)	4–6 (4.7)	5–6 (5.5)
sc	22–36 (27.4)	24–28 (24.4)	20–30 (25.2)	26–32 (28.2)	14–17 (15.0)	16–28 (19.8)
sq	15–25 (21.5)	10–15 (11.7)	15–18 (16.8)	22–35 (27.3)	14–18 (16.0)	12–16 (14.6)
LR1	1.31–1.19 (1.16)	1.26–1.37 (1.32)	1.13–1.23 (1.17)	1.39–1.54 (1.48)	1.49–1.63 (1.56)	1.59–1.70 (1.65)
LR2	0.57–0.66 (0.60)	0.54–0.61 (0.58)	0.54–0.61 (0.57)	0.53–0.59 (0.57)	0.60–0.63 (0.61)	0.63–0.66 (0.65)
LR3	0.67–0.72 (0.70)	0.75–0.81 (0.78)	0.73–0.81 (0.76)	0.70–0.79 (0.75)	0.77–0.79 (0.78)	0.76–0.78 (0.77)
TR1	0.20–0.22 (0.21)	0.26–0.28 (0.27)	0.81–0.20 (0.19)	0.26–0.28 (0.27)	0.29–0.31 (0.30)	0.26–0.28 (0.27)
BR1	1.8–2.6 (2.4)	2.9–4.6 (3.5)	6.6–9.0 (7.2)	2.4–3.5 (2.9)	3.2–3.6 (3.4)	4.5–4.7 (4.6)
BR2	2.2–2.9 (2.6)	3.1–5.1 (4.3)	4.4–8.7 (6.8)	5.0–7.8 (6.2)	4.0–6.1 (5.0)	5.0–6.7 (5.9)
BR3	4.1–5.6 (4.6)	4.4–6.1 (5.1)	5.0–9.8 (7.5)	3.3–7.6 (5.3)	5.7–9.8 (7.2)	5.9–6.7 (6.3)

MALES COLLECTED FROM THE NIKKO AREA

Ortho cladius chuze sextus ♯2 (10)	*Ortho-cladius chuze septimus* (*small fm*) ♯26A (11)	*Ortho-cladius chuze septimus* (*large fm*) ♯26B (10)	*Psectro-cladius yuno-quartus* ♯27 (10)	*Eukieffe-riella chuze octavus* ♯28 (3)	*Eukieffe-riella chuze-nonus* ♯29 (3)	*Paratricho cladius tamaater* ♯30 (3)
3 65–4 14 (3 90)	3 30–4 53 (3 90)	4 64 5 31 (4 99)	4 23–5 07 (4 67)	2 43–2 80 (2 58)	2 06–2 26 (2 15)	2 60 2 73 (2 68)
2 50–2 92 (2 71)	1 90–2 45 (2 06)	2 66 3 33 (2 99)	2 49–2 91 (2 72)	1 80–1 90 (1 84)	1 30 1 50 (1 42)	1 53–1 70 (1 61)
1 64–1 87 (1 78)	1 76 2 36 (2 03)	2 57–3 00 (2 69)	1 78 2 04 (1 91)	0 75 0 87 (0 81)	0 45–0 69 (0 54)	0 76 0 93 (0 86)
0 54–0 61 (0 58)	0 53 0 66 (0 59)	0 53–0 62 (0 56)	0 54–0 66 (0 60)	0 42–0 46 (0 44)	0 27 0 31 (0 29)	0 45–0 51 (0 47)
0 71 09 (0 90)	0 90–1 00 (0 96)	0 87 1 13 (1 00)	1 12–1 42 (1 27)	1 4 –1 54 (1 49)	0 79–1 00 (0 90)	0 78 0 86 (0 83)
10 15 (11 2)	14–16 (15 2)	14 18 (15 8)	6 8 (7 1)	5–6 (5 7)	6 8 (6 7)	5–7 (6 0)
16–22 (18 2)	12 22 (17 0)	16 22 (19 0)	12–17 (14 6)	6–7 (6 3)	4–6 (5 0)	7–12 (9 7)
4 0 (7 8)	6–8 (7 0)	6 9 (7 5)	4 8 (6 5)	3–4 (3 5)	2 (2 0)	5 (5 0)
6 10 (7 2)	8–10 (9 0)	8–10 (9 0)	0 (0)	12–14 (13 0)	4–6 (5 0)	8 12 (10 0)
6 8 (6 8)	8–12 (10 0)	8–14 (11 0)	10 15 (11 7)	8 14 (9 0)	5–7 (6 0)	15 19 (17 0)
3 5 (4 0)	4–5 (4 6)	4–5 (4 7)	4–6 (5 0)	3–4 (3 3)	3 4 (3 3)	3 (3 0)
12 18 (13 8)	5 20 (17 4)	16–29 (22 3)	3–5 (3 3)	7–10 (8 3)	6 8 (6 8)	9 12 (10 3)
24–35 (29 4)	24 33 (26 0)	24 29 (28 2)	30–36 (32 0)	12–15 (13 5)	5–8 (6 5)	4 7 (6 2)
0 67–0 69 (0 68)	0 75 0 79 (0 77)	0 75 0 79 (0 77)	0 70–0 75 (0 73)	0 63–0 67 (0 65)	0 59–0 60 (0 59)	0 58 0 59 (0 59)
0 52–0 54 (0 53)	0 53–0 56 (0 54)	0 53 0 57 (0 55)	0 48 0 51 (0 50)	0 47 0 55 (0 52)	0 46–0 49 (0 48)	0 48–0 52 (0 50)
0 56 0 59 (0 57)	0 58–0 60 (0 59)	0 57–0 61 (0 59)	0 57 0 62 (0 59)	0 55 0 60 (0 58)	0 54–0 55 (0 55)	0 58–0 59 (0 58)
0 13 0 14 (0 14)	0 13 0 15 (0 14)	0 12–0 14 (0 13)	0 12–0 13 (0 13)	0 15 0 18 (0 16)	0 16 0 17 (0 17)	0 14 0 15 (0 14)
26–31 (28)	16–33 (25)	32 38 (35)	22–32 (28)	28–30 (29)	31–42 (35)	29–30 (25)
26 49 (38)	25–35 (30)	37 46 (41)	23–32 (28)	34–36 (35)	33–38 (36)	29–36 (33)
48 79 (63)	36–40 (33)	46–60 (53)	31–45 (38)	43–55 (49)	38–40 (41)	30–37 (34)

STANDARD MEASUREMENT DATA OF ADULT

	Cricotopus yuno-quintus #31 (5)	*Cricotopus trifasci-atus* #32 (7)	*Diplo-cladius cultriger* #34 (5)	*Parametrio-cnemus chuze decimus* #35 (7)	*Limno phyes tama kireides* #36 (2)	*Smittia sainoko-ensis* #37 (7)
BL (mm)	2 58 3 00 (2 75)	3 56 4 39 (3 99)	2 93–3 16 (3 04)	4 33–5 27 (4 70)	1 70 1 85 (1 78)	1 88 2 65 (2 40)
WL (mm)	1 52 1 76 (1 64)	1 95–2 24 (2 11)	2 10–2 26 (2 19)	2 60–2 73 (2 66)	0 95 1 00 (0 98)	1 55 1 87 (1 69)
AR	0 9 1 20 (1 07)	1 65–1 87 (1 70)	1 68 1 91 (1 79)	1 63 1 83 (1 73)	0 31–0 32 (0 32)	1 89 2 38 (2 16)
AHR	0 50 0 56 (0 53)	0 53–0 58 (0 55)	0 41–0 57 (0 50)	0 48 0 56 (0 52)	0 26 0 28 (0 27)	0 56–0 75 (0 63)
ER	1 21–1 43 (1 32)	0 85–1 00 (0 93)	1 00–1 33 (1 16)	0 62 –0 76 (0 70)	1 25 (1 25)	1 03–1 8 (1 10)
so	4–6 (5 0)	4–6 (5 5)	2 (2)	12–18 (15 0)	7 8 (7 5)	8–14 (11 3)
cl	12–18 (13 8)	10–17 (13 4)	4 (4)	8–12 (10 0)	20 22 (2 0)	6–8 (7 1)
pn	4 6 (5 0)	3 4 (3 2)	2 (2)	6–10 (7 9)	8 10 (9 0)	3–5 (3 8)
dm	18 25 (20 5)	12 16 (14 4)	6 8 (7 5)	0 (0)	0 (0)	6 10 (8 4)
dl	37 43 (35 7)	18 26 (22 4)	4 6 (5 0)	11 2 (16 3)	64–70 (68 3)	17 30 (22 8)
pa	4 6 (5 0)	3 5 (3 9)	2 (2)	6 8 (7 9)	7 8 (7 3)	6–12 (9 5)
sc	24 40 (30 2)	8–14 (11 0)	4–6 (5 6)	10 18 (14 4)	6 8 (7 0)	16–26 (18 8)
sq	5 6 (5 2)	20 28 (22 7)	0 (0)	22–41 (31 9)	5 (5)	0 (0)
LR1	0 53–0 55 (0 54)	0 55 0 57 (0 56)	0 75 0 79 (0 77)	0 88–0 92 (0 90)	0 45 0 46 (0 46)	0 52–0 62 (0 56)
LR2	0 46–0 48 (0 47)	0 44–0 50 (0 47)	0 48–0 49 (0 48)	0 54 0 56 (0 55)	0 43–0 44 (0 44)	0 40–0 47 (0 44)
LR3	0 51 0 52 (0 52)	0 51–0 54 (0 52)	0 52–0 54 (0 53)	0 62 0 65 (0 63)	0 54–0 56 (0 55)	0 53 –0 60 (0 57)
TR1	0 13 0 14 (0 13)	0 11–0 12 (0 12)	0 10–0 13 (0 12)	0 13–0 16 (0 15)	0 13–0 14 (0 14)	0 12 0 13 (0 12)
BR1	1 9–2 (2 0)	1 9 2 2 (2 0)	3 0 4 2 (3 7)	2 8 5 2 (3 6)	2 1–2 2 (2 2)	3 7 6 9 (4 7)
BR2	2 0–2 6 (2 3)	2 2–2 6 (2 4)	3 6–4 4 (4 1)	3 2–5 4 (3 8)	2 5–2 8 (2 7)	5 0–6 4 (5 6)
BR3	2 2–2 8 (2 5)	2 4 3 5 (2 9)	4 8 6 2 (5 8)	4 5–6 1 (5 5)	2 5–3 0 (2 8)	10 9 11 8 (11 2)

MALES COLLECTED FROM THE NIKKO AREA

Epoico-cladius chuze decimus #38 (2)	*Thiene-manniella chuzeduo decimus* #39 (4)	Prodiamesa sp #40 (2)	*Abla-besmyia* sp #41 (8)	*Pentaneura* sp #42 (10)	*Procladius* sp #43 (3)
2 11–2 20 (2 16)	1 23 1 37 (1 30)	6 43 7 35 (1 89)	4 35–5 00 (4 63)	2 46–3 06 (2 71)	4 57–4 93 (4 77)
1.34 1 43 (1 49)	0 64–0 71 (0 68)	3 20–4 10 (3 67)	2 65 3 00 (2 79)	1 70 1 90 (1 77)	2 40 2 47 (2 43)
0 67 0 69 (0 68)	0 46 0 48 (0.47)	2 68 2 85 (2 77)	1 96 2 22 (2 11)	1 29–1 48 (1 40)	1 93–2.11 (2 00)
0 38 -0 42 (0 40)	0 36–0 38 (0 37)	0 49–0 61 (0 55)	0 50–0 54 (0 52)	0 40–0 63 (0 48)	0 49–0 51 (0 50)
1 31–1 42 (1 37)	1 30 - 1 52 (1 40)	0 51 0 54 (0 53)	0 36–0 52 (0 43)	0 22 - 0 36 (0 30)	0 31–0 33 (0 32)
4 (4)	0 (0)	10–14 (12 0)	34–45 (40 3)	10–15 (12 5)	28–33 (30 0)
4 (4)	8 9 (8 3)	14 16 (15 0)	44–62 (50 5)	14–18 (16 1)	16 19 (17 0)
3–4 (3 6)	1 2 (1 3)	4–8 (5 8)	12–15 (13 7)	2 5 (2 3)	14 16 (15 0)
0 (0)	0 (0)	0 (0)	68 93 (78 3)	26–33 (29 6)	60–71 (65 3)
4 6 (5 0)	7 10 (8 8)	7–14 (10 3)	40–53 (47 2)	28–36 (32 2)	33–41 (38 0)
3 (3)	3 (3)	5–10 (7 5)	21–37 (28 6)	9–16 (11 4)	8 17 (13 0)
2 (2)	2 (2)	30 32 (31 0)	44–75 (59 1)	15–20 (17 6)	66–70 (68 0)
0 (0)	0 (0)	37–40 (38 5)	43 63 (54 2)	16 26 (21 1)	49–58 (53 7)
0 53–0 54 (0 54)	0 72–0 76 (0 74)	0 81 0 83 (0 82)	0 81–0 84 (0 83)	0 83–1 00 (0 90)	0 66–0 72 (0 70)
0 48 -0 50 (0 59)	0 61–0 65 (0 63)	0 49 0 50 (0 50)	0 75 0 81 (0 78)	1 00–1 04 (1 02)	0 57 0 68 (0 63)
0 53–0 55 (0 54)	0 63–0 67 (0 65)	0 56–0 58 (0 57)	0 82–0 88 (0 85)	0 86–1 02 (0 94)	0 68 0 74 (0 70)
0 12 0 13 (0 13)	0 12 0 13 (0 13)	0 13–0 14 (0 14)	0 14–0 16 (0 15)	0 11–0 13 (0 12)	0 13–0 15 (0 14)
3 4–3 6 (3 5)	2 4–2 6 (2 5)	2 1 2 3 (2 2)	3 3–4 7 (3 9)	3 7 5 5 (4 6)	2 2 2 4 (2 3)
3 6–3 8 (3 7)	2 5 2 7 (2 6)	2 2–2 4 (2 3)	4 6–7 9 (5 4)	4 4 4 8 (4 6)	3 6 4 2 (3 9)
5 0 5 2 (5 1)	2 5 2 9 (2 7)	2 5–2 6 (2 6)	5 1–6 8 (6 1)	5 1 -5 6 (5 4)	3 6 4 2 (3 9)

COMPARISON OF PUPAL CHAETOTAXY

Code No	Species name	No exam	Length abdom (mm)	TRO (No.)	Hd No	Lateral setae of abdomen II	III	IV	V	VI	VII	VIII	CL	Anal fin No fringe	Anal fin No seta
01	*Micropsectra yunoprima*	1	6.43	1 560 580	225	sss sss	sss sss	LsL LLL	LsL LLL	LLLL LLLL	LLLL LLLL	LLLLL	7–8	73–75	L
02	*Micropsectra chuzeprima*	6	5.00 5.31	1 800 880	85 121	sss	sss	LLL	LLL	LLLL	LLLL	LLLLL	5–6	84–104	L
03	*Micropsectra chuzenotescens*	4	3.36 3.75	1 344 376	89 134	sss	sss	LsL	LLL	LLL	LLLL	LLLLL	3 6	29–38	L
04	*Micropsectra chuzelonga*	3	3.16 3.60	1	83 126	sss	sss	LsL	LLL	LLLL	LLLL	LLLLL	7–18	39–52	L
05	*Tanytarsus yunosecundus*	3	2.53 3.3	1 360–598	52 56	sss	sss	sss	sss	sss	ssLL	LLLLL	n	30–37	LL
06	*Tahytarsus chuzesecundus*	10	3.07–3.73	1 730–870	94–130	sss	sss	sss	LLL	LLL	LLLL	LLLL	n	37–44	LL
07	*Tanytarsus gregarius*	3	3.47–3.57	1 400–416	75–93	sss	sss	sss	ssL	ssL	ssLL	LLLLL	n	36 45	LL
10	*Chironomus nipponensis*	10	6.90 -8.90	n	69–95	sss	sss	sss	LLLLLLLL		LLLL	LLLLL	3 6	91–132	
12	*Dicrotendipes lobiger*	7	5.05–5.36	n	42–61	sss	sss	sss	LLLL	LLLL	LLLL	LLLLL	1–3	36–66	
13	*Paracladopelma camptolabis*	2	3.67–3.83	n	42–52	sss	sss	sss	LLLL	LLLL	LLLL	LLLLL	none	40–44	
14	*Demicryptochir chuzequartus*	3	3.04–3.14	n	134–157	sss	sss	sss	LLLL	LLLL	LLLL	LLLLL	5 7	78–97	
15	*Stictochironomus akizukii*	8	5.63 -7.25	n	63 114	sss	sss	sss	LLL	LLL	LLLL	LLLL	8–12	38–75	
16	*Stictochironomus multannulatus*	6	3.80–4.20	n	71 91	sss	sss	sss	LLL	LLL	LLLL	LLLLL	5 8	36–41	
17	*Phaenopsectra kizakiensis*	2	5.89 6.98	11	73 75	sss	sss	sss	LLL	LLL	LLLL	LLLL	6 8	36–52	
19	*Polypedilum nubeculosum*	0	5.1.–6.10	8	54–70	sss	sss	sss	LLL	LLL	LLLL	LLLL	n	30 47	
23	*Polypedilum tamagohanum*	3	2.93–3.17	8	54 67	sss	sss	sss	sss	sss	ssss	sssss	n	21 26	
25	*Orthocladius chuzesextus*	10	3.02 3.95	1 291–350	61–104	sss	sss	sss	sss	sss	ssss	sssss		none	SSS
26	*Otthocladius chuzeseptimus*	10	3.05 4.50	1 288–488	35–.46	ssss	ssss	ssss	ssss	LLLL	LLLL	LLLLL		none	SSS
27	*Psectrocladius yunoquartus*	8	3.03–4.75	1 270–395	none	sss	sss	sss	sss	sss	sss	ssss		none	SSS
30	*Paratrichocladius tamaater*	2	2.10 2.13	1 206–216	52 54	sss	sss	sss	sss	sss	sss	ssss		none	SSS
31	*Cricotopus trifasciatos*	.	2.25	1 111 115	56	sss	sss	sss	sss	sss	ssss	ssss		none	SSS
32	*Cricotopus trifasciatus*	8	3.25–4.15	1 148 -233	82–115	sss	sss	sss	sss	sss	sss	ssss		none	SSS
35	*Parametriocnemus chuzedecimus*	6	3.52–4.51	1 320–464		sss	sss	sss	sss	sss	LLL	LLLLL		18 25	SSS

EXPLANATION OF FIGURES

(1) *Micropsectra yunoprima*, **sp. nov.**

Fig. 1. Male. A. head. **B.** tip of antenna. **C.** dorsal view of scutum and scutellum. **D.** tip of front leg, lateral view. **E.** do, ventral view. **F.** wing. **G.** frontal tubercles. **Female. H.** head. **I.** wing. **J.** frontal tubercles. **K, L.** spermathecae. **M.** cercus.

Fig. 2. Male. A. hypopygium, dorsal view. **B.** hypopygium, ventral view. **C.** anal point. **D.** appendage 1, dorsal view. **E.** appendage 1, ventral view. **F.** appendages 2 and 2-a. **G.** tip of front tibia. **H.** tip of hind tibia.

Fig. 3. Pupa. A. thoracic respiratory organ. **B.** abdominal tergites I-VI. **C.** abdominal tergites VII-IX. **D.** spines on terigte II (II-c and II-d, enlarged). **E.** spine patch on tergite III (III-c). **F.** spine patch on tergite IV (IV-a). **G.** spinose area on tergite V. **H.** spinose area on tergite VI. **I.** caudolateral scale on segment VIII.

(2) *Micropsectra chuzeprima*, **sp. now.**

Fig. 4. A. wing, male and female. **B.** female palp. **C.** female antenna. **D.** tip of front tibia and base of front tarsus I, male. **E.** tip of hind tibia, male. **F.** middle tarsus V. **G.** female cercus. **H.** spermathecae. **I.** thoracic respiratory organ of pupa.

Fig. 5. Male hypopygium. A. dorsal view. **B.** ventral view. **C.** anal point. **D.** appendage 1, dorsal view. **E.** appendades 1 and 1-a, ventral view. **F.** appendages 2 and 2-a, dorsal view.

Fig. 6. Pupa. A. ventral abdominal tergites I to VI. **B.** abdominal tergites VII to IX. **C.** spines of tergites II (II-c, II-d). **D.** spine patch on tergite III. **E.** basal spinose area of tergite IV (IV-a). **F.** basal spinose area of tergite V (V-a). **G.** first lateral hair of segment III. **H.** lateral hairs of segment VIII. **I.** caudolateral scale of segment VIII. **J.** do, entire view.

Fig. 7. Larva. A. antenna. **B.** maxilla. **C.** labial and paralabial plate. **D.** mandible **E.** labram. **F.** premandible. **G.** claws on anterior pseudopod. **H.** anal segment. **I.** base of preanal hair tuft. **J.** claws on posterior pseudopod.

(3) *Micropsectra chuzenotescens*, **sp. nov.**

Fig. 8. Adult. A. wing, male and female. **B.** head, male. **C.** head, female. **D.** scutum and scutellum, male. **E.** do, female. **F.** tip of front tibia, male. **G.** tip of middle tibia, male. **H.** middle tarsus V, male. **I.** cercus, female. **J.** spermathecae, female.

Fig. 9. A. Male hypopygium, dorsal view. **B.** do, ventral view. **C.** appendage 1, dorsal view. **D.** appendage 1 and 1-a, ventral view. **E.** appendage 2, dorsal view. **F, G.** thoracic respiratory organs, pupa.

Fig. 10. Pupa. A. abdominal tergites I to V. **B.** abdominal tergites VI to IX.

C. spines on tergite II (a to d). D. spine patch on tergite III (right side). E. spine patch on tergite IV. F. spine patch on tergite V. G. spine patch on tergite VI. H. caudolateral scales on segment VIII.

(4) *Micropsectra chuzelonga*, **sp. nov.**

Fig. 11. Male. A. hypopygium, dorsal view. B. do, ventral view. C. appendage 1, dorsal view. D. do, ventral view. E. appendage 2, dorsal view. F. tip of front tibia. G. tip of hind tibia. H. middle tarsus V.

Fig. 12. Male (A-C): A. head. B. frontal tubercles. C. scutum and scutellum. **Pupa (D-H) :** D. thoracic respiratory organ. E. spine patch on abdominal tergite III, right side. F. spine patch on tergite IV, right side. G. spine patch on tergite V, right side. H. spine patch on tergite VI, right side.

Fig. 13. Pupa A. abdomdnal tergites I to V. B. abdominal tergites VI to IX. C. spines on tergite II, central portion. D. spinulous area on tergite VII. E. spinulous area on tergite VIII. F. candolateral scales on segment VIII.

(5) *Tanytarsus yonosecundus*, **sp. nov.**

Fig. 14. Adult. A. wing, male and female. B. female palp. C. female antenna. D. frontal tubercles, male. E. frontal tubercles, famale. F. tip of front tibia, male. G. tip of middle tibia, male. H. tip of front tibia, female. I. tip of hind leg, female. J. female cercus. K. spermathecae.

Fig. 15. Male hypopygium. A. appendage I, dorsal view. B. appendage 2, dorsal view, C. gonostylus. D. hypopygium, dorsal view. E. hypopygium, ventral view. F. anal point. G. appendages 2 and 2-a, ventral view. H. appendage 1, ventral view.

Fig. 16. Pupa. A. thoracic respiratory organ. B. abdominal tergites. C. spines on tergite II (II-b, II-c, II-d). D. spine patch on tergite III. E. spine patch on tergite IV. F. spine patch on tergite V. G. spine patch on tergite VI. H. caudolateral scale on segment VIII. I. anal segment, left half, dorsal view. J. anal segment, right half, ventral view.

Fig. 17. Larva. A. labial plate and paralabial plates. B. mandible. C. antenna. D. premandible. E. maxilla. F. labrum, epipharynx and premandibles. G. claws on anterior pseudopods. H. base of preanal hair tuft. I. claws on posterior pseudopods.

(6) *Tanytarsus chuzesecundus*, **sp. nov.**

Fig. 18. Adult. A. wing, male and female. B. head, female. C. palp, female. D. antenna, female. E. frontal tubercles, male. F. frontal tubercles and bases of antenna, female. G. tip of front tibia, male. H. tip of hind tibia, male. I. cercus, female. J. spermathecae.

Fig. 19. Male. A. head. B. tip of antenna. C. scutum and scutellum. D. anal point. E. appendages 2 and 2-a. F. appendages 1 and 1-a, ventral view.

G. do, dorsal view. **H.** hypopygium, dorsal view.

Fig. 20. Pupa. A. thoracic respiratory organs. **B.** abdomen, dorsal view. **C.** spinose area II-a. **D.** spines of II-d. **E.** spine patch III-a. **F.** spine patch V-a. **G.** spines of I-a, II-b. and III-b. **H.** spine patch IV-a. **I.** spine patch VI-a. **J.** caudolateral scale of VIII. **K.** anal segments.

Fig. 21. larva. A. antenna. **B.** labial plate and paralabial plates. **C.** maxilla. **D.** mandible. **E.** labrum. **F.** claws on anterior pseudopod. **G.** base of preanal hair tuft. **H.** claws on anterior pseudopod.

(7) *Tanytarsus gregarius* Kieffer

Fig. 22. Male. A. head. **B.** wing. **C.** scutum and scutellum. **D.** tip of front tibia. **E.** tip of middle tibia. **F.** tip of hind tibia. **G.** front tarsus V. **H.** appendage 1, dorsal view. **I.** appendage 2 and 2-a, dorsal view. Specimen No. 50 : 31 from Lake Yunoko.

Fig. 23. Male hypopygium. A. dorsal view of a specimen No. 51 : 31 from Lake Chuzenji, with elongalte anal point. **B.** appendage 1 of the same specimen. **C.** left side appendages 2 and 2-a. **D, E.** dorsal and ventral view of male hypopygium of a specimen No. 50 : 31 from Lake Yunoko, with truncate anal point.

Fig. 24. Pupa. A. thoracic respiratory organ. **B.** abdominal tergites I to V. **C.** do, VI to IX. **D.** spines on tergite II. (II-a to II-d). **E.** spine patch of tergite III. **F.** spine patch on tergite IV. **G.** spine patch on tergite V. **H.** spine patch on tergite VI. **I.** caudolateral scales on segment VIII.

(12) *Dicrotendipes lobiger* (Kieffer)

Fig. 25. Adult. A. wing, male and female. **B.** head, male. **C.** head, female. **D.** female palp. **E.** female antenna. **F.** frontal tubercles, male. **G.** frontal tubercles, female. **H.** tip of front tibia, female. **I.** tip of middle tibia, female. **J.** spermathecae. **K.** cercus.

Fig. 26. Adult. A. male hypopygium, dorsal view. **B.** do, ventral view. **C.** tip of front tibia, male. **D.** tip of hind tibia, male. **E.** tip of hind leg, male. **F.** appendages 1 and 2, dorsal view. **G.** appendages 1 and 2, ventral view. **H.** scutum and scutellum, female. **I.** do, male.

Fig. 27. Pupa. A. abdominal segments I-IV, lateral view. **B.** abdominal segments V-IX, lateral view. **C.** caudal spines on tergite II (II-d). **D.** spines on tergite III (III-c). **E.** caudal spines on tergite IV (IV-c). **F.** spines on sternite II. **G, H.** spines on sternite III. **I.** spinules on tergite VII. **J.** spinules on tergite VIII. **K.** spines on caudolateral corners of sternite IV. **L.** caudolateral scales on segment VIII (examples of variation). **M.** thoracic respiratory organ.

Fig. 28. Larva. A. labial plate and paralabial plate. **B.** antenna. **C.** maxilla. **D.** mandible. **E.** claws on anterior psedopods. **F.** base of preanal hair tuft. **G.** claws on posterior pseudopods. **H.** anal segment, dorsal view.

(13) *Paracladopelma* **camptolabis Kieffer.**

Fig.29. Male. A. frontal tubercles. **B.** wing. **C.** hypopygium, left half, dorsal view. **D.** hypopygium, ventral view. **E.** dorsal appendage, dorsal view. **F.** ventral appendage (above) and dorsal appendage (below) , ventral view. **G.** tip of front tibia. **H.** tip of middle tibia. **I.** front tarsus V.

Fig. 30. Pupa. A. abdominal teriges II to VI. **B.** do, VII to IX. **C.** spines of II-d. **D.** spines of III-c. **E.** spinules of IV-a. **F.** spines of IV-c. **G.** spinules of V-a. **H.** spines of V-c. **I.** spinules of VI-a. **J.** spines of VI-c. **K.** spinules of VII-a. **L.** spinules of VIII-a. **M.** spinules of IX-a.

(14) *Demicriptochironomus chuzequartus,* **sp. nov.**

Fig. 31. Male.. A. wing. **B.** frontal tubercles. **C.** terminal scales of hind tibia. **D.** tip of front tibia. **E.** hypopygium, dorsal view. **F.** dorsal (above) and ventral (below) appendages. **G.** hypopygium, ventral view.

Fig. 32. Pupa. A, A'. abdominal tergites I to VII and VIII, IX. **B.** spines on tergites, II-c, II-d, III-c, IV-c. **C.** caudolateral scale of VIII. **D.** spinose area on caudolateral corners of sternite IV (IV-w). **E.** spinulous area of tergite VIII. **F.** abdominal segments VIII and IX.

(15) *Stictochironomus akizukii* **(Tokunaga)**

Fig. 33. Adult. A. wing, male and female. **B.** thorax and abdominal segments I and II, male, lateral view. **C.** front (f) , middle (m) and hind (h) legs of male, showing position of pale rings. **D.** tip of front tibia. **E.** tip of hind leg. **F.** tip of middle tibia. **G.** tip of hind tibia.

Fig. 34. Adult. A. head, male. **B.** tip of male antenna. **C.** head, female. **D.** female antenna. **E.** female spermathecae. **F.** female cercus.

Fig. 35. Male hypopygium. A. dorsal view. . **B.** ventral view of hypopygium. **C.** appendage 1 (dorsal appendage). **D.** appendage 2 (ventral appendage). **E.** anal point. **F.** gonostylus.

Fig. 36. Pupa. A. abdominal segments I-V. **B.** abdominal segments VI-IX, lateral view. **C.** spines on tergite II (II-a, II-b, II-c, II-d). **D.** spines on tergite III (III-a, III-b, III-c, III-d). **E.** spines on tergite IV (IV-a). **F.** spinules on sternite II (II-v). **G.** spinules on sternite III (III-v). **H.** spinose area in caudolateral corners of sternite IV (IV-w). **I.** spinose area in caudolateral corners of sternite V (V-w). **J.** spines on sternite VI (VI-v and VI-w). **K.** spinules on tergite VII (VII-a). **L.** spinules on sternite VII (VII-v). **M.** spinules on tergite VIII (VIII-a). **N.** spinules on sternite VIII (VIII-v). **P.** caudolateral scale of segment VIII.

Fig. 37. Larva. A. mandible. **B.** labrum, premandible and epipharynx. **C.** labial plate and paralabial plate. **D.** antenna. **E.** maxilla. **F.** claws on anterior pseudopods. **G.** claws on posterior pseudopods. **H.** base of preanal hair tuft. **I.** anal segment, lateral view.

(16) *Stictohironomus multannulatus* (Tokunaga)

Fig. 38. Adult. A. wing, male and female. **B.** head, male. **C.** tip of antenna, male. **D.** tip of front tibia, male. **E.** tip of hind tibia, male. **F.** female antenna. **G.** head, female. **H.** lateral view of antepronotum, scutum and scutellum, male. **I.** tip of front tibia, female. **J.** tip of hind tibia, female. **K.** female cercus. **L.** spermathecae.

Fig. 39. Male. A. hypopygium, dorsal view. **B.** do, ventral view. **C.** ventral appendage, dorsal view. **D.** anal point, lateral view. **E.** anal point, ventral view. **F.** dorsal appendage, dorsal view. **G.** gonostylus, dorsal view. **H.** do, ventral view. **I.** scutum and scutellum, dorsal view. **J.** legs, showing relative length of segments, and coloration. **K.** front tarsus V.

Fig. 40. Pupa. A. abdominal tergites. **B.** spines of II-c, II-d, III-c, III-d, IV-c, IV-d. **C.** caudolateral spinose area on sternite IV (IV-w). **D.** caudolateral spinose area on sternite V (V-w). **E.** middle spinose area on tergite VI (VI-b). **F.** spinules on tergite VII (VII-a) and VIII (VIII-a). **G.** caudolateral scale of segment VIII. **H.** anal segments.

(17) *Phaenopsectra kizakiensis* (Tokunaga)

Fig. 41. Adult. A. wing, male and female. **B.** head, male. **C.** tip of antenna, male. **D.** scutum and scutellum, male. **E.** head, female. **F.** scutum and scutellum, female. **G.** cercus, female.

Fig. 42. Adult. A. male hypopygium, dorsal view. **B.** gonostylus. **C.** ventral appendage. **D.** anal point. **E.** dorsal appendage. **F.** tip of front tibia, **G.** tip of hind tibia, male. **H.** hind tarsus V, male. **I.** middle trasus V, female.

Fig. 43. Pupa. A. thoracic respiratory organ. **B.** abdominal tergites I-V. **C.** abdominal tergites VI-IX. **D.** caudolateral scale on segment VIII. **E.** some spines on abdominal segments.

Fig. 44. Larva. A. labial plate and paralabial plate. **B.** premandible. **C.** maxilla. **D.** mandible. **E.** antenna. **F.** labrum, **G.** claws on anterior pseudopods. **H.** bases of preanal hair tuft. **I.** claws on posterior pseudopods. **J.** anal segment.

(18) *Microtendipes chloris* (Meigen)

Fig. 45. Male. A. head. **B.** antepronotum. **C.** thorax. dorsal view. **D.** wing. **E.** tip of front tibia. **F.** tip of middle tibia. **G.** tip of hind tibia. **H.** front tarsus V.

Fig. 46. Male hypopygium. A. dorsal view. **B.** ventral view. **C.** anal point, dorsal view. **D.** dorsal appendage, dorsal view. **E.** dorsal appendage, ventral view. **F.** ventral appendage, dorsal view. **G.** gonostylus, dorsal view.

(19) *Polypedilum nubeculosum* (Meigen)

Fig. 47. Adult. A. wing, male and female. **B.** head, male. **C.** tip of antenna, male. **D.** head, female. **E.** antenna, female. **F.** scutum and scutellum, female. **G.** spermathecae. **H.** cercus, female.

Fig. 48. Male. A. hypopygium, dorsal view. **B.** and point, lateral view. C. ventral appendage. D. dorsal appendage. **E.** anal point. **F.** scutum and scutellum. **G.** tip of front tibia. **H.** tip of hind tibia. **I.** hind tarsus V.

Fig. 49. Pupa. A. thoracic respiratory organ. **B.** abdominal tergites I-V. **C.** abdominal tergites VI-IX. **D.** some spines and spinules on abdomen. **E.** caudolateral scale of segment VIII.

Fig. 50. Larva. A. labial plate and paralabial plate. **B.** antenna. **C.** labrum, epipharynx and premandible. **D.** maxilla. **E.** mandible. **F.** claws on anterior pseudopods. **G.** claws on posterior pseudopods. **H.** anal segments, dorsal view.

(20) *Polypedilum asakawaense* Sasa

Fig. 51. Male. A. wing. **B.** tip of front tibia. **C.** tip of hind tibia. **D.** hypopygium. **E.** ventral appendage, dorsal view.

(21) *Polypedilum tamanigrum* Sasa

Fig. 51. Male. F. wing. **G.** tip of front tibia. **H.** tip of hind tibia. **I.** hypopygium. **J.** dorsal appendage.

(22) *Polypedilum* sp. "chuzetripodrum"

Fig. 52. Male. A. wing. **B.** tip of front tibia. **C.** tip of hind tibia. **D.** hypopygium. E. ventral appendage.

(23) *Polypedilum tamagohanum* Sasa

Fig. 52. Male. F. wing. **G.** tip of front tibia. **H.** tip of hind tibia. **I.** hypopygium. **J.** ventral appendage.

Fig. 53. Pupa. A, B. thoracic respiratory organs. **C.** abdominal tergites I to V. **D.** do, VI to IX. **E.** IV-w, or caudolateral spine patch on sternite IV. F, G. caudolateral scale of abdominal segment VIII.

Fig. 54. Pupa. A. spines on abdominal tergites II (II-a to II-d) , III (III-a to III-d) , and IV (IV-a to IV-c). **Larva. B.** antenna. **C.** mandible. **D.** labial plate and paralabial plate. **E.** labrum and premandible. **F.** base of preanal hair tuft. **G.** claws on posterior pseudopod.

(24) ***Polypedilum*** **sp. "chuzenudum"**

Fig. 54. Male. H. tip of hind tibia. **I.** tip of front tibia. **J.** hypopygium. **K.** dorsal appendage. **L.** ventral appendage.

(25) ***Orthocladius chuzesextus*** **sp. nov.**

Fig. 55. Adult. A. head, male. **B.** head, female. **C.** tip of front tibia. **D.** tip of middle tibia, **E.** tip of middle tarsus I, **F.** tip of middle tarsus II, **G.** tip of hind tibia, **H.** front tarsus V, **I.** wing, **J.** scutum and scutellum, male. **K.** spermathecae, **L.** cercus, female.

Fig. 56. Male. A. abdominal tergites III and IV. **B.** tergites VII and VIII. **C.** hypopygium, left half, dorsal view. **D.** hypopygium, left half, ventral view. **E.** right inner lobe of gonocoxite, dorsal view. **F-I.** anal point of different specimens.

Fig. 57. Pupa. A. thoracic respiratory organs. **B.** abdominal segments I to V, lateral view, left half sternites, right half tergites. **C.** spines on tergite II (II-b, II-c, II-d). **D.** spines on tergite III. **E.** spines on tergite IV. **F.** spines on tergite VI. **G.** spinules on sternite II. **H.** spinules on sternite III. **I.** caudolateral spines on sternite IV (IV-w). **J.** caudolateral spines on sternite VII (VII-w). **K.** spinules on sternite IV.

Fig. 58. A. abdominal segments VI to IX, lateral view. **B.** spinules (VII-a) and spines (VII-c) on tergite VII, and spinules on tergite VIII. **C.** tip of anal fin, and terminal setae, left side.

Orthocladius sp., male, pupa and associated larval skin (A specimen with abnormal arrangement of terminal bristles in pupa). **D.** thoracic respiratory organ of pupa. **E.** terminal segment, showing contour of male hypopygium and pupal skin. **Larva (F-L). F.** antenna, **G.** labial plate, **H.** mandible, **I.** premandible, **J.** maxilla, **K.** base of preanal hair tuft, **L.** claws on posterior pseudopod.

(26) ***Orthocladius (Euortkocladius) chyzeseptimus,*** **sp. nov.**

Fig. 59. Adult (all drawn from a small form). **A.** head, male. **B.** head, female. **C.** antepronotum, scutum and scutellum, male. **D.** scutum and scutellum, female. **E.** tip of front tibia, **F.** tip of middle tibia. **G.** tip of middle tarsus I. **H.** tip of middle tarsus II. **I.** tip of hind tibia. **J.** hind tarsus V, male. **K.** hind tarsus V, female. **L.** spermathecae, **M.** cercus, female.

Fig. 60. Male hypopygium (**A** to **E** : the small form ; **F** to **J** : the large form). **A.** dorsal view, **B.** ventral view, **C.** anal point, **D.** inner margin of gonocoxite, and gonostylus, ventral view, **E.** inner lobe of gonocoxite and gonostylus, dorsal view, the large form. **F.** gonostylus, dorsal view, **G.** anal point, **H.** inner margins of gonocoxites and ventral view of anal point, **I.** hypopygium, dorsal view, left half, **J.** inner lobe of right gonocoxite, dorsal view, the small form.

Fig. 61. A. wing, male and female, **B.** abdominal tergites III to V, showing bases of setae, male, small form. **C.** thoracic respiratory organ, pupa, small form (left) and large form (right). **D.** spines on abdominal tergite II (II-b, II-c,

II-d), **E.** do, tergite III, **F.** do, tergite VI, (VI-b, VI-c), **G.** do, tergite VII (VII-b), lateral view, pupa of a small form specimen.

Fig. 62. Pupa. A. abdominal segmens I to IV, lateral view. **B.** do, V to IX. **C.** spine groups V-c, V-d, V-v, V-u. **D.** caudolateral whirl-like spine groups on sternite IV (IV-w) and sternite VII (VII-w). **E.** spine or spinule groups VII-c, VII-v, VIII-a, IX-a. **F.** spinule groups VII-a, VIII-v.

Fig. 63. A. anal segments, pupa, **B.** base of terminal bristles of anal fin, with 4 spines, large form. **C.** base of terminal bristles of anal fin, with 2 spines, small form. **Larva (D-L). D.** maxilla. **E.** labrum and prerandibles. **F.** mandible. **G.** antenna. **H.** labial plate. **I.** claws on anterior pseudopod. **J.** base of preanal hair tuft. **K.** claws on posterior pseudopod. **L.** anal segment.

(27) *Psectrocladiius yunoquartus*, sp. nov.

Fig. 64. Adult. A. head, male. **B.** head, female. **C.** wing, male and female. **D.** tip of antenna, male. **E.** female antenna. **F.** scutum and scutellum, female. **G.** middle tarsus V, female. **H.** cercus, female. **I.** spermatheca, female.

Fig. 65. Male. A. abdominal tergite II. **B.** hind tausus V. **C.** inner lobe of gonocoxite, and gonostylus. **D.** tip of middle tibia. **E.** tip of front tibia. **F.** tip of hind tibia. **G.** tip of hind tarsus I. **H.** tip of hind tarsus II. **I.** scutum and scutellum. **J.** hypopygium, dorsal view. **K.** anal point.

Fig. 66. Pupa. A. thoracic respiratory organ. **B.** abdominal tergites. **C.** spines II-b, II-c, II-d. **D.** spine III-a. **E.** spines III-b, III-c, III-d. **F.** spine group IV-a. **G.** spines IV-b, IV-c. **H.** spine group V-a. **I.** spines V-c. **J.** spine group VI-a. **K.** spines VI-c. **L.** caudolateral spine groups on abdominal sternite IV, or IV-w. **M.** spines V-w. **N.** spines VI-w.

Fig. 67. Larva. A. labial plate. **B.** maxilla. **C.** labrum, epipharynx and premandible. **D.** antenna. **E.** mandible. **F.** claws on anterior pseudopods. **G.** anal segments, lateral view. **H.** claws on posterior pseudopods, **I.** base of preanal hair tuft.

(28) *Eukiefferiella chuzeoctavus*, sp. nov.

Fig. 68. Male. A. head. **B.** tip of antenna. **C.** wing. **D.** hypopygium, dorsal view. **E.** hypopygium, ventral view.

(29) *Eukiefferiella chuzenonus*, sp. nov.

Fig. 69. Male. A. head. **B.** last segment of antenna. **C.** thorax, lateral view. **D.** wing. **E.** tip of front tibia. **F.** tip of middle tibia. **G.** tip of hind tibia. **H.** tip of hind tarsis I. **I.** tip of hind tarsus II. **J.** hind tarsus V. **K.** hypopygium, dorsal view. **L.** hypopygium, ventral view. **M.** gonostylus.

(30) *Paratrichocladius tamaater* Sasa

Fig. 70. Male. A. thorax, lateral view. **B.** wing. **C.** tip of front tibia. **D.** tip of middle tibia. **E.** tip of hind tibia, lateral view. **F.** do, inner view. **G.** front tarsus V. **H.** hind tarsus V. **I.** hypopygium, dorsal view. **J.** hypopygium, ventral view. **K.** inner margin of gonocoxite, and gonostylus, right side.

Fig. 71. A. head, male. Pupa (B-G). **B.** thoracic respiratory organs from two specimens. **C.** abdominal segments I to VI, lateral view. **D.** do, VII to IX, lateral view. **E.** spines on tergite II (II-c and II-d). **F.** spines on tergite III (III-a, III-c, III-d). **G.** caudolateral spinose area of sternite IV.

(31) *Cricotopus yunoquintus*, sp. nov.

Fig. 72. Male and **female. A.** wing. **B.** head, female. **C.** antenna, female. **D.** head, male. **E.** tip of antenna, male. **F.** thorax, lateral view, male. **G.** thorax, lateral view, female. **H.** front (f), middle (m), and hind (h) legs of female, showing white tibial rings. **I.** front tarsus V, female, showing claws and empodium. **J.** spermathecae, female. **K.** cercus, female.

Fig. 73. Male. A. hypopygium, dorsal view. **B.** hypopygium, ventral view. **C.** inner lobe of gonocoxite, ventral view. **D.** abdominal ternites II, III and IV, showing distribution of setae (abse noly for the left side). **E.** front (f), middle (m) and hind (h) legs. **F.** tip of front tibia. **G.** tip of middle tibia. **H.** tip of hind tibia, inner view. **I.** tip of hind tibia, lateral view. **J.** front tarsus V.

Fig. 74. Pupa. A. thoracic respiratory organs, and base of associated hairs. **B.** abdominal segments I-VII, lateral view. **C.** some spines on abdominal tergites II-V. **D.** spinose areas in caudolateral corners of sternites IV-VI. **E.** anal segments, dorsal view.

(32) *Cricotopus trifasciatus* (Meigen)

Fig. 75. Adult. A. wing, male and female. **B.** head, female. **C.** antenna, female. **D.** palp, female. **E.** thorax, abdominal segment I and II, lateral view. **F.** head, male. **G.** tip of antenna, male. **H.** abdominal tergites, male, showing coloration and bases of bristles. **I.** spermathecae, female. **J.** cercus, female.

Fig. 76. Male. (excepting **E** and **G**). **A.** hypopygium, dorsal view. **B.** hypopygium, ventral view. **C.** ninth tergite (left half), inner margin of gonoxocite, and gonostylus, dorsal view. **D.** scutum and scutellum, dorsal view. **E.** scutum and scutellum, female. **F.** coloration of legs, male. **G.** coloration of legs, female. **H.** tip of front tibia. **I.** tip of middle tibia. **J.** tip of hind tibia.

Fig. 77. Pupa. A. thoracic respiratory organ and associated setae. **B.** thoracic respiratory organs of another specimen. **C.** abdominal tergites. **D.** spines II-c and II-d. **E.** spines III-c and III-d. **F.** caudolateral spines on sternites III. **G.** anal segments.

Fig. 78. Larva. A. labial plate. **B.** maxilla. **C.** mandible. **D.** antenna.

E. epipharynx and premandible, ventral view. **F.** labrum, dorsal view. **G.** claws on anterior pseudopods. **H.** hair pencil on abdominal segment. **I.** preanal hair tuft. **J.** base of preanal hair tuft. **K.** claws on posterior pseudopods.

(33) *Brillia longifurca* Kieffer

Fig. 79. Male. A. head. **B.** left antepronotum. **C.** scutum and scutellum. **D.** tip of front tibia. **E.** tip of middle tibia. **F.** hypopygium, dorsal view. **G.** hypopygium, ventral view. **H.** dorsal appendage. **I.** gonostylus, dorsal view. **J.** gonostylus, ventral view.

Fig. 80. A. tip of hind tibia, male. **B.** head, female. **C.** antenna, female. **D.** scutum and scutellum, female. **E.** spermathecae. **F.** cercus, female. **G.** thoracic respiratory organs, pupa. **H.** abdominal tergites VI-IX, pupa.

(34) *Diplocladius cultriger* Kieffer

Fig. 81. Male. A. head. **B.** tip of antenna. **C.** scutum and scutellum. **D.** wing. **E.** abdominal tergites II-V. **F.** tip of front tibia. **G.** tip of middle tibia. **H, I.** tip of hind tibia. **J.** front tarsus V.

Fig. 82. Male. A. hypopygium, dorsal view. **B.** hypopygium, ventral view. **C.** gonostylus, dorsal view. **D.** gonostylus, ventral view. **E.** inner lobe of gonocoxite.

(35) *Parametriocnemus chuzedecimus*, sp. nov.

Fig. 83. Adult. A. head, male. **B.** tip of antenna, male. **C.** head, female. **D.** antenna, female. **F.** thorax, dorsal view, female. **F.** wing, male. **G.** wing, female. **H.** tip of front tibia, male. **I.** tip of middle tibia, male. **J.** tip of hind tibia, male. **K.** front trasus V, male. **L.** spermathecae, female. **M.** cercus, female.

Fig. 84. A. male hypopygium, dorsal view, right half. **B.** male hypopygium, ventral view and contour of inner skeleton. **C. D.** thoracic respiratory organ, pupa. **E.** abdominal tergites VIII and IX, pupa. **F.** spines and spinules on segment VIII (VIII-a and VIII c on tergite, VIII-v on sternite).

Fig. 85. Pupa (A-K): A. abdominal tergites I to VIII. **B.** spines on tergite II. **C.** spines on tergite III. **D.** spines on tergite IV. **E.** spies on tergite V. **F.** spines on tergite VI. **G.** spines on tergite VII. **H.** spine patche in caudolateral corner of sternite IV, or VI-w. **I.** spine patch VI-w. **J.** spine patch VII-w. **K.** spines on caudal margin of tergite VIII. **Larva (L-T)** : **L.** maxilla. **M.** labrum. **N.** premandible. **P.** labial plate. **Q.** antenna and mandible. **R.** claws on anterior pseudopod. **S.** base of preanal hair tuft. **T.** claws on posterior pseudopod.

(36) *Limnophyes tamakireides* Sasa

Fig. 86. Male. (A-H): A. head. **B.** scutum and scutellum. **C.** dorsolateral setae of scutum, showing two types. **D.** tip of front tibia. **E.** tip of middle tibia, **F, G.** tip of hind tibia. **H.** hypopygium. **Female (I-L): I.** head. **J.** left antepronotum. **K.** spermathecae. **L.** cercus.

(37) *Smittia sainokoensis,* **sp. nov.**

Fig. 87. Adult. A. head, female. **B.** tip of male antenna, with strong terminal seta. **C.** male wing. **D.** female wing. **E.** scutum and scutellum, male. **F.** antepronotum, scutum and scutellum, female. **G.** spermathecae. **H.** cercus. **I.** male hypopygium.

(38) *Epoicocladius chuzeundecimus,* **sp. nov.**

Fig. 88. Male. A. Head. **B.** front tarsus IV and V. **C.** hypopygium, dorsal view. **D.** hypopygium, ventral view. **E.** anal point. **F.** inner lobe of gonocoxite, and gonostylus.

Fig. 89. Adult A. male wing. **B.** female wing. **C.** thorax, dorsal view, male. **D.** do, female. **E.** head, female. **F.** front tarsus IV and V, female. **G.** tip of front tibia, male. **H.** tip of middle tibia, male. **I.** tip of hind tibia, male. **J.** spermathecae, female. **K.** cercus, female.

(39) *Thienemanniella chuzeduodecimus.* **sp. nov.**

Fig. 90. Male. A. head. **B.** wing. **C.** tip of front tibia. **D.** tip of middle tibia. **E.** tip of hind tibia. **F.** front tarsus IV and V. **G.** thorax. **H.** hypopygium, left half, dorsal view. **I.** hypopygium, ventral view.

(40) *Prodiamesa* **sp.**

Fig. 91. Male (A-H) A. male head. **B.** wing. C. tip of front tibia. **D.** tip of middle tibia. **E.** tip of middle tarsus I. **F.** tip of middle tarsus II. **G.** tip of hind tibia. **H.** hind tarsus V. **Female (I-K) I.** female head. **J.** three spermathecae. **K.** cercus.

Fig. 92. Male hypopygium. A. dorsal view. **B.** ventral view and inner skeleton. **C.** anal point and hind margin of ninth tergite. **D.** right gonostylus. **E.** dorsal appendage of gonocoxite. **F.** ventral appendage of gonocoxite. **G.** basal appendages of gonocoxite.

Fig. 93. A. scutum and scutellum of male. **B.** do, female. **C.** antepronotum of female. **Larva (D-K). D.** antenna. **E.** mandible. **F.** labial plate, and right paralabial plate. **G.** labrum and epipharynx. **H.** claws on anterior pseudopods. **I.** preanal and anal segments, lateral view. **J.** base of

preanal hair tuft. **K.** claws on posterior pseudopods.

Fig. 94. Pupa. A. thoracic respiratory organ. **B.** abdominal tergites I-IV. **C.** abdominal tergites VII-IX. **D.** spines on abdominal tergites II. **E.** spines on III. **F.** spine cluster on caudolateral corner of tergite II. **G.** whirl-like spinose area in caudolateral corner of sternite IV. **H.** setae and short hairs on lateral margin of segment VIII.

(41) *Syndiamesa* sp.

Fig. 95. Male. A. wing. **B.** tip of antenna. **C.** antepronotum. **D.** scutum and scutellum. **E.** tip of front tibia. **F.** tip of middle tibia. **G.** tip of hind tibia. **H.** tip of middle tarsus I. **I.** tip of middle tarsus II. **J.** tip of middle tarsus III. **K.** middle tarsus IV and V. **L.** hypopygium, left half.

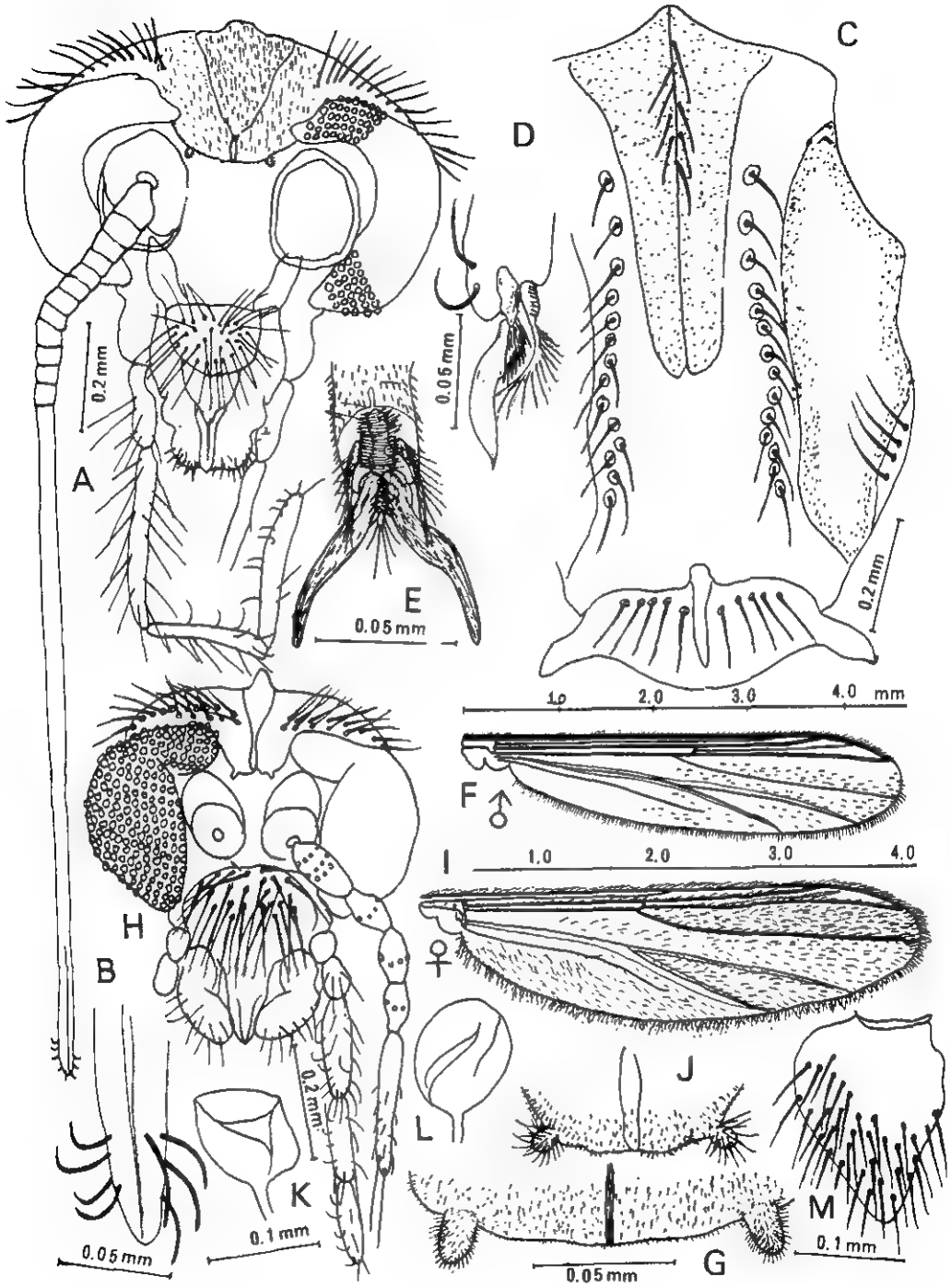

Fig. 1. ***Micropsectra yunoprima*, sp. nov. Male.**

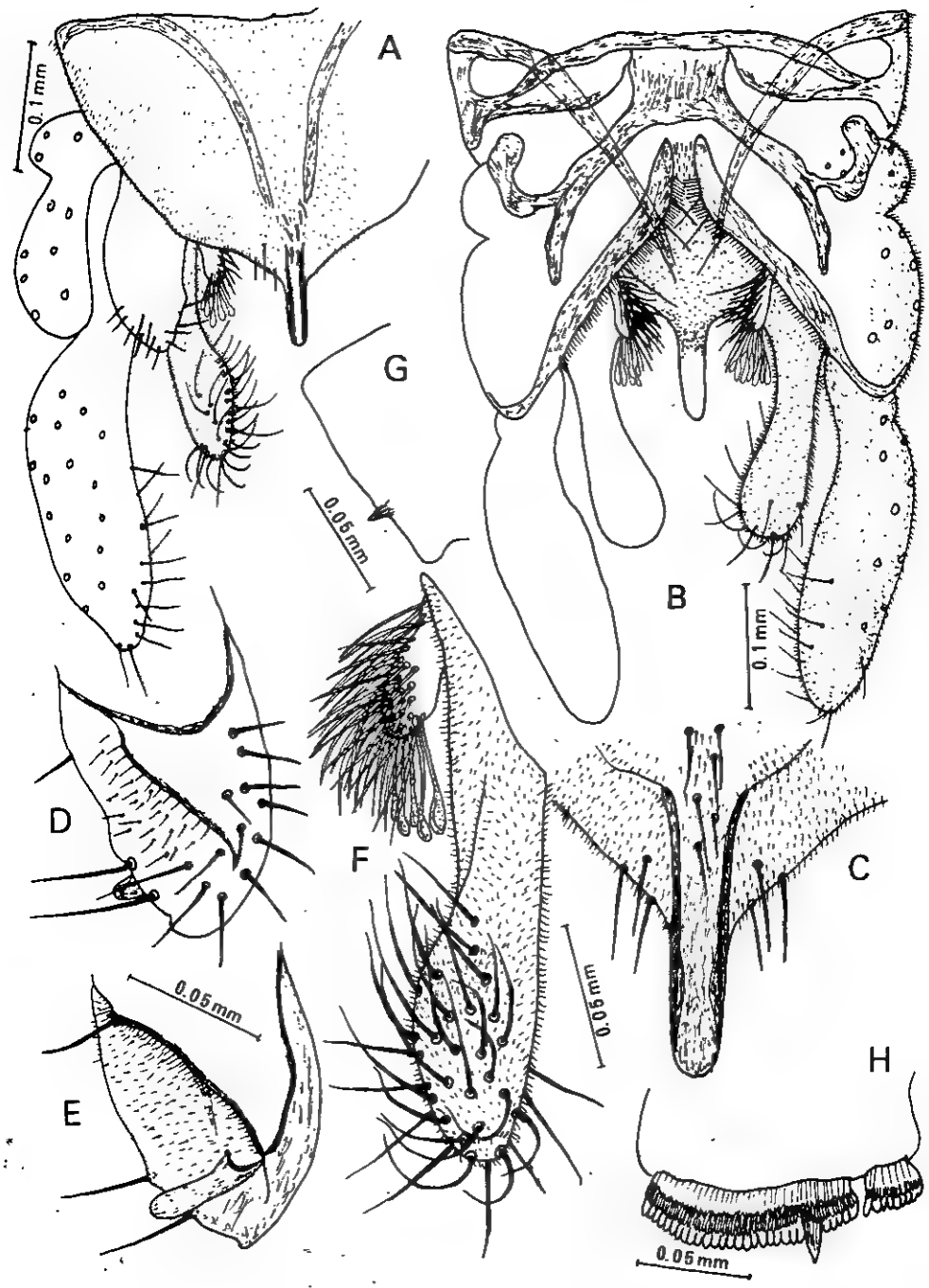

Fig. 2. ***Micropsectra yunoprima,*** **sp. nov. Male.**

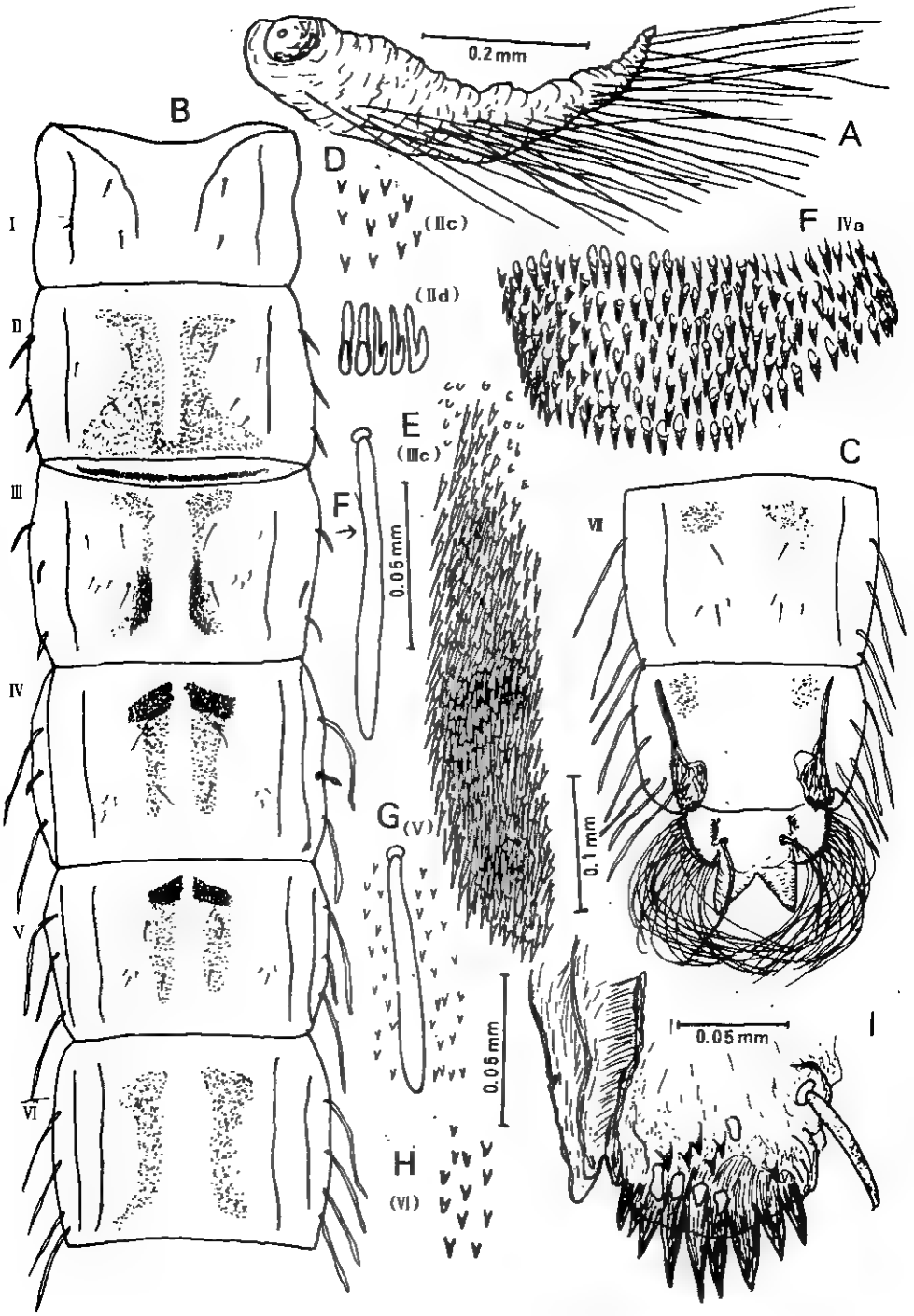

Fig. 3. ***Micropsectra yunoprima,*** **sp. nov. Pupa.**

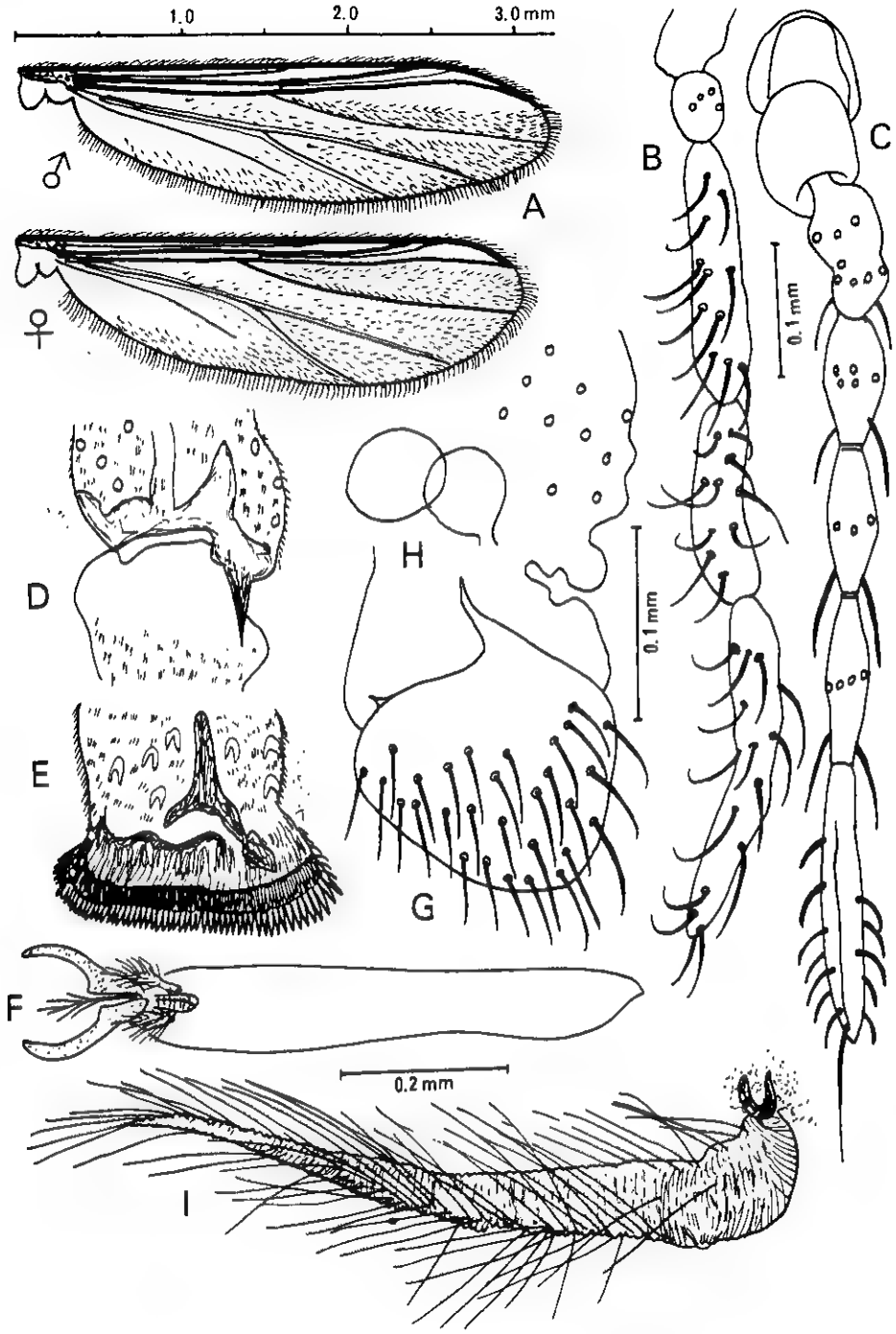

Fig. 4. ***Micropsectra chuzeprima,*** **sp. nov.**

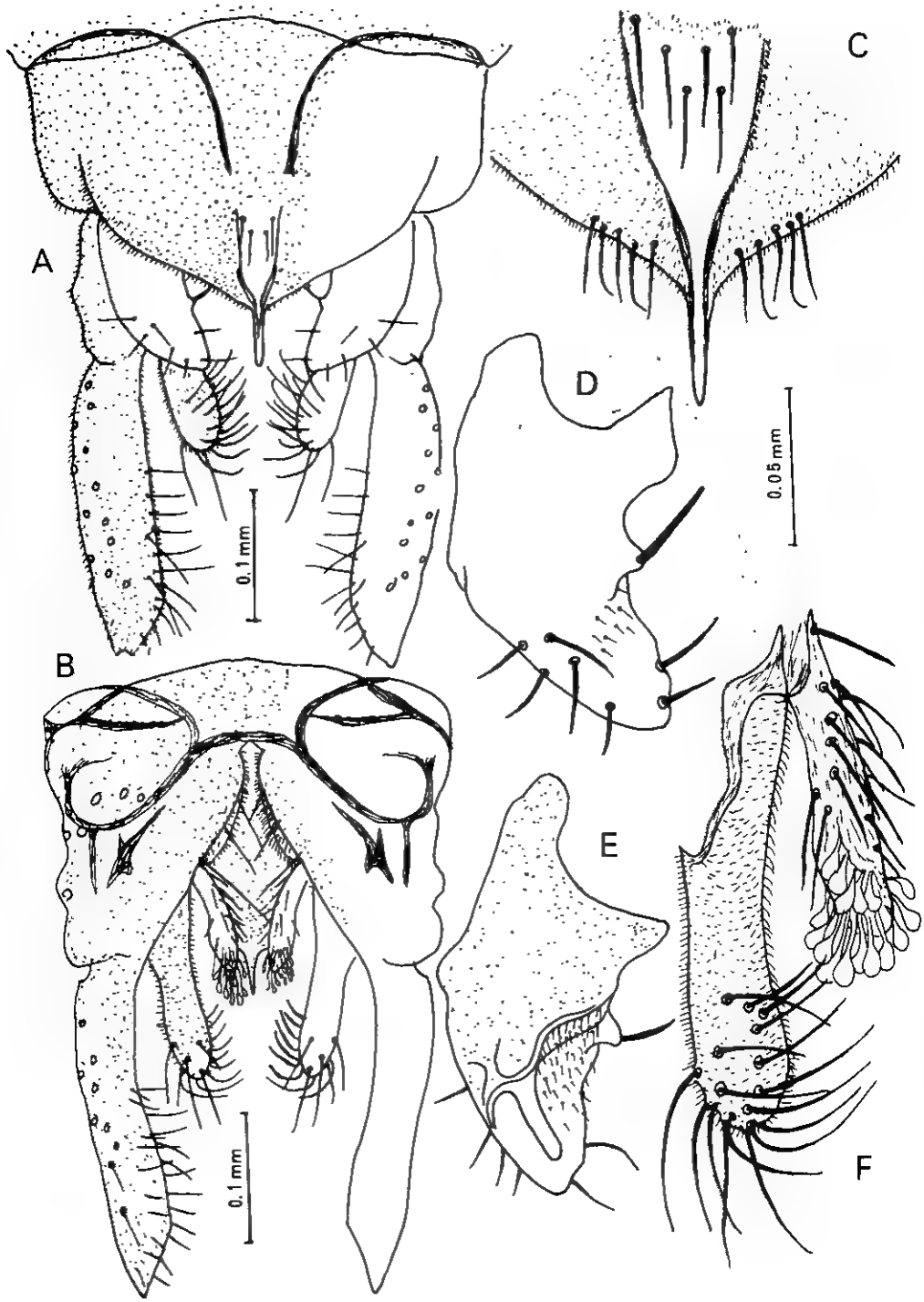

Fig. 5. ***Micropsectra chuzeprima*, sp. nov. Male.**

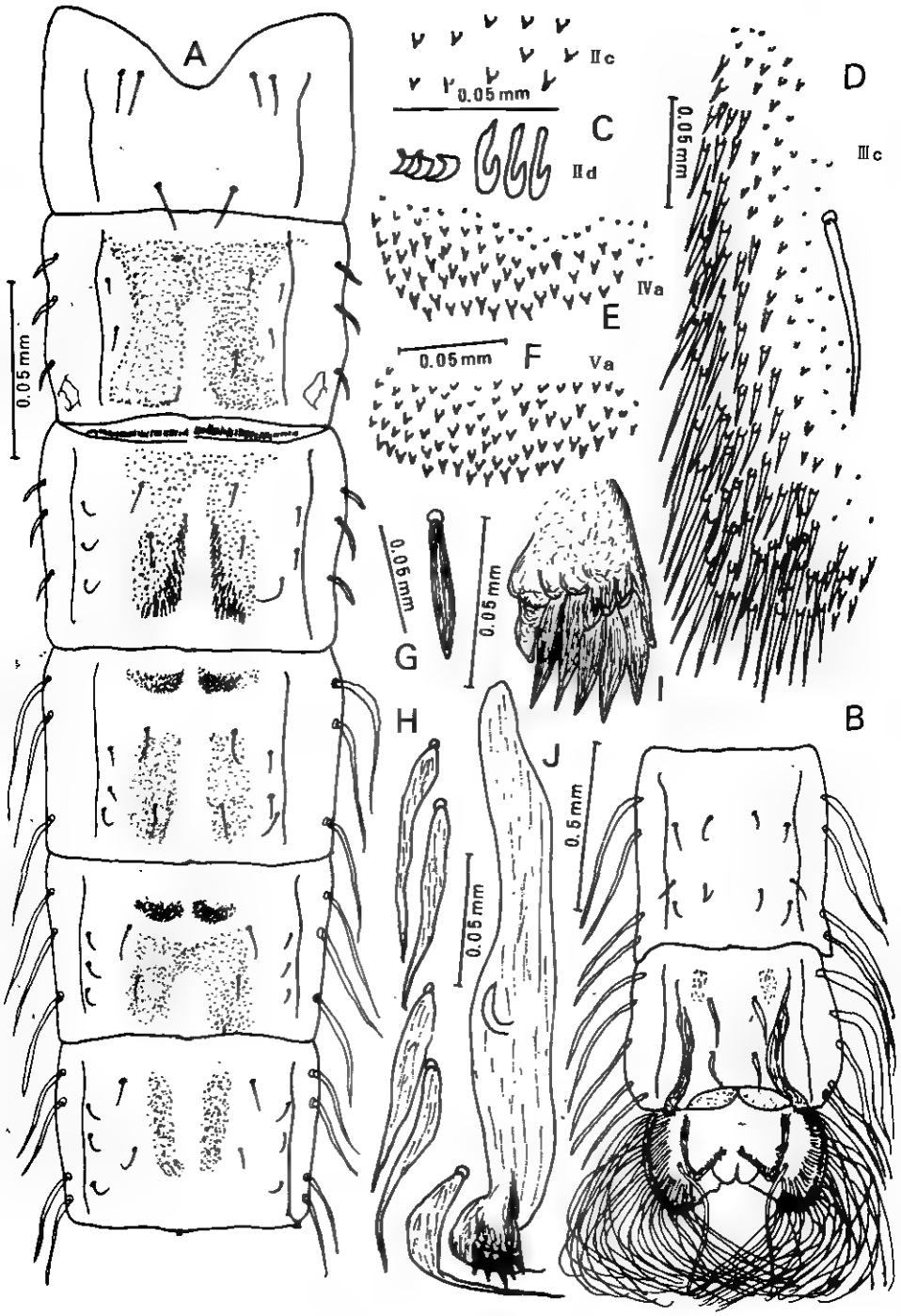

Fig. 6. ***Micropsectra chuzeprima,*** **sp. nov. Pupa.**

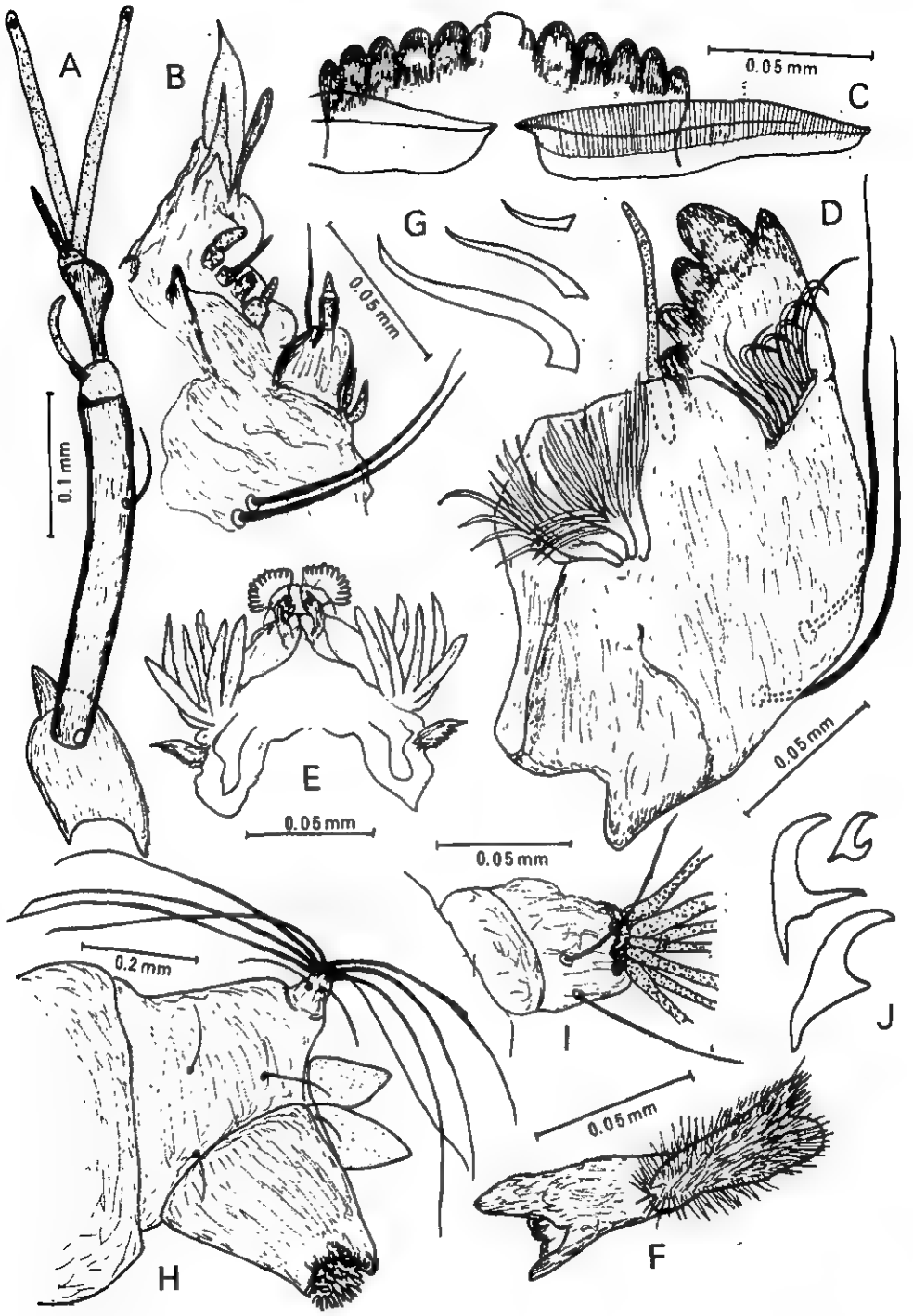

Fig. 7. ***Micropsectra chuzeprima,*** **sp. nov. Larva.**

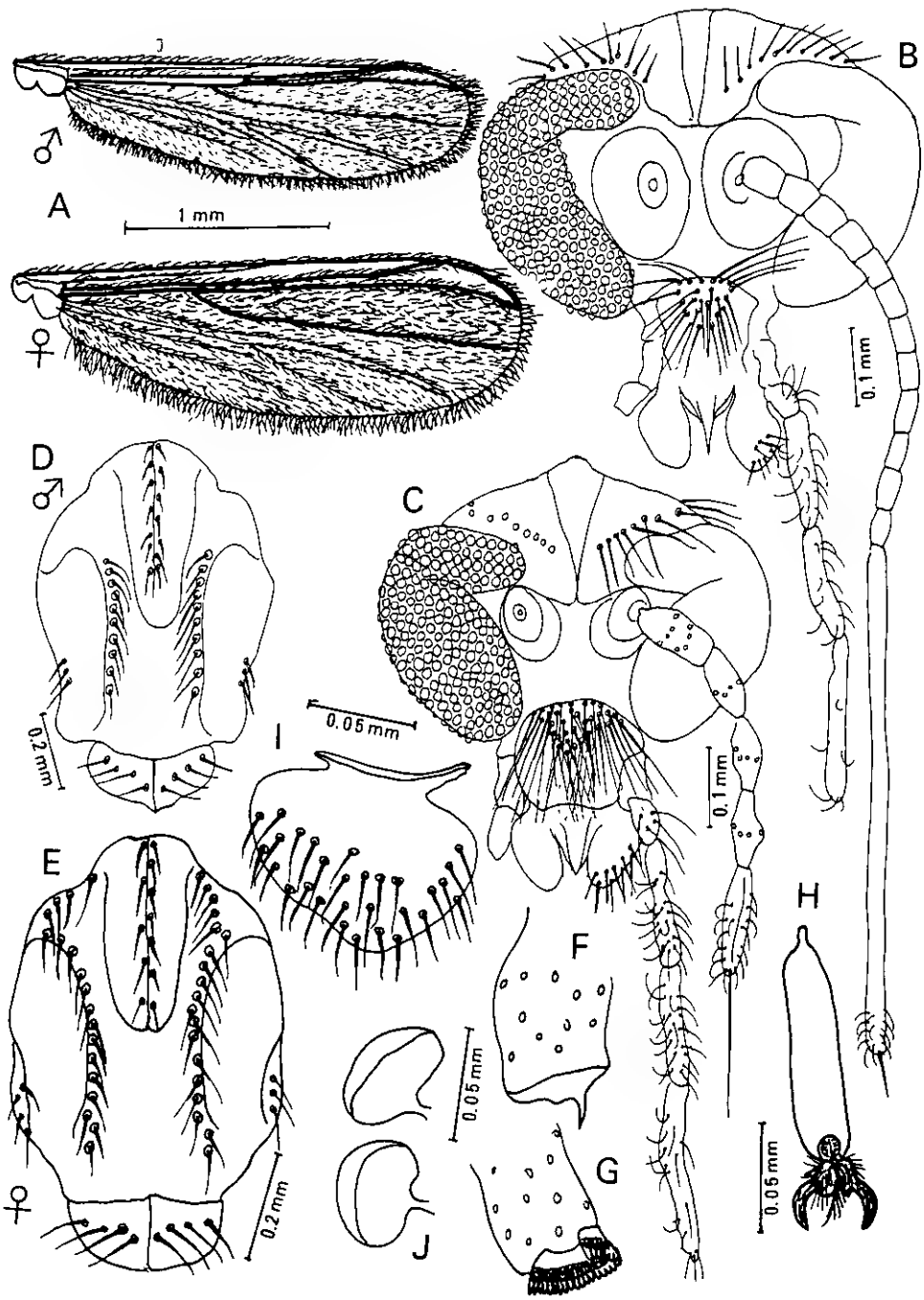

Fig. 8. ***Micropsectra chuzenotescens,*** **sp. nov. Adult.**

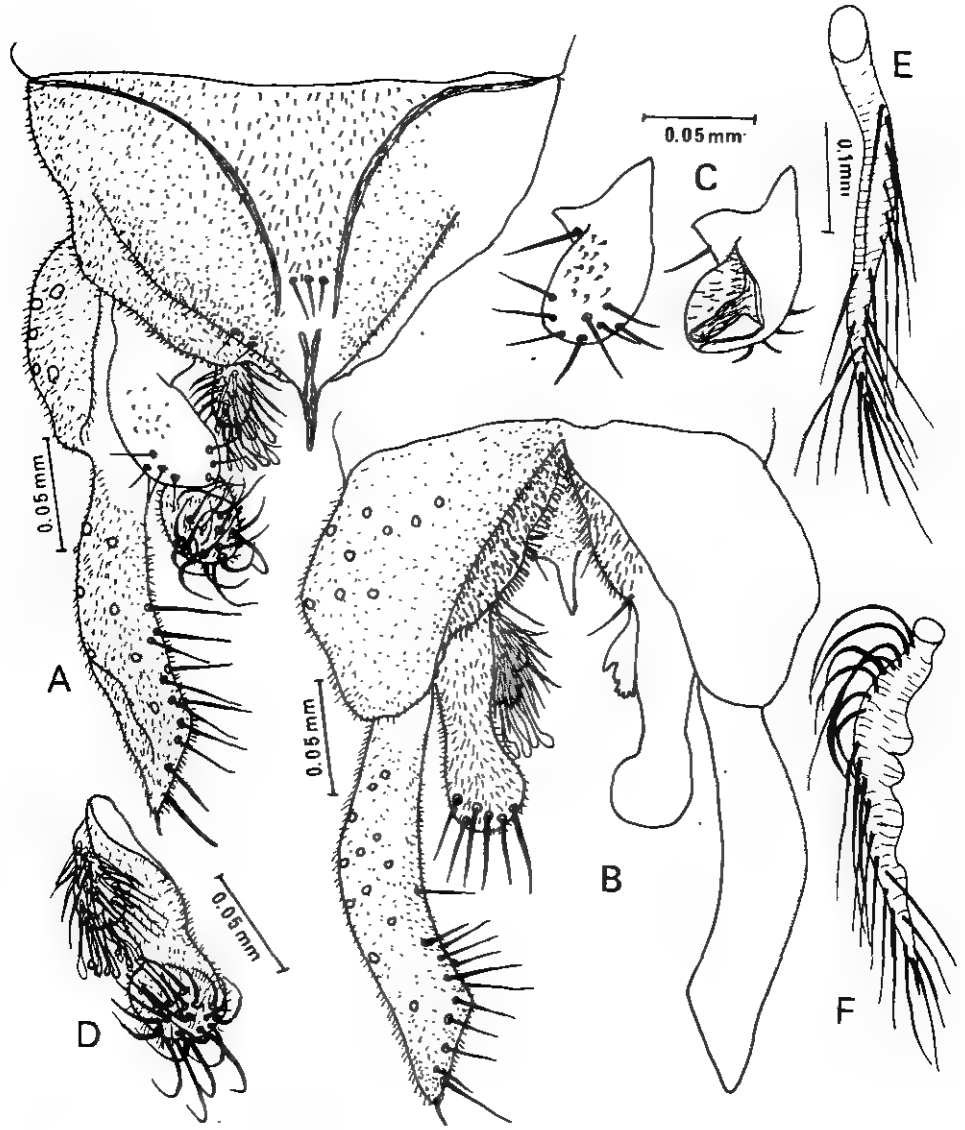

Fig. 9. ***Micropsectra chuzenotescens,*** **sp. nov. Male.**

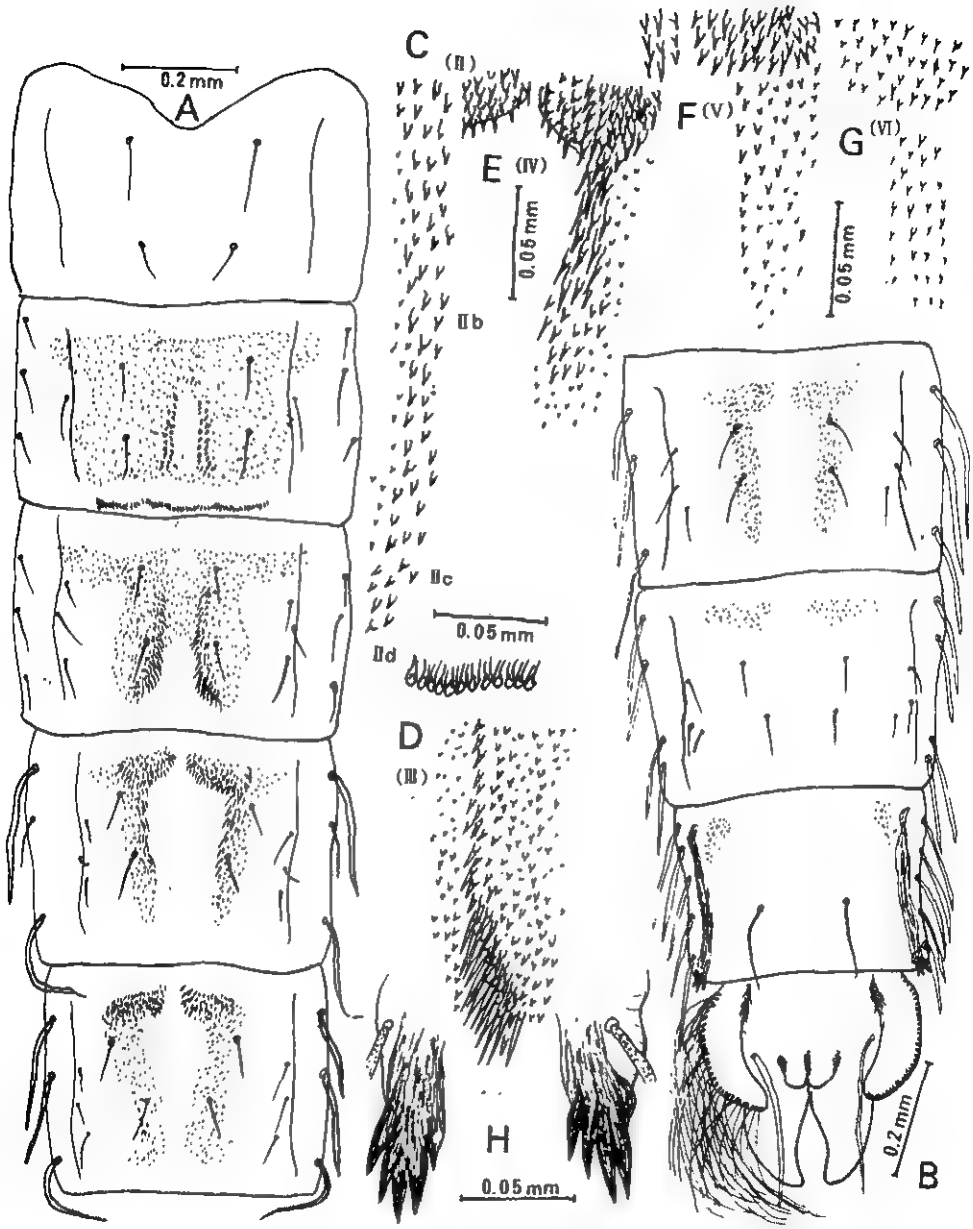

Fig. 10. · ***Micropsectra chuzenotescens*, sp. nov. Pupa.**

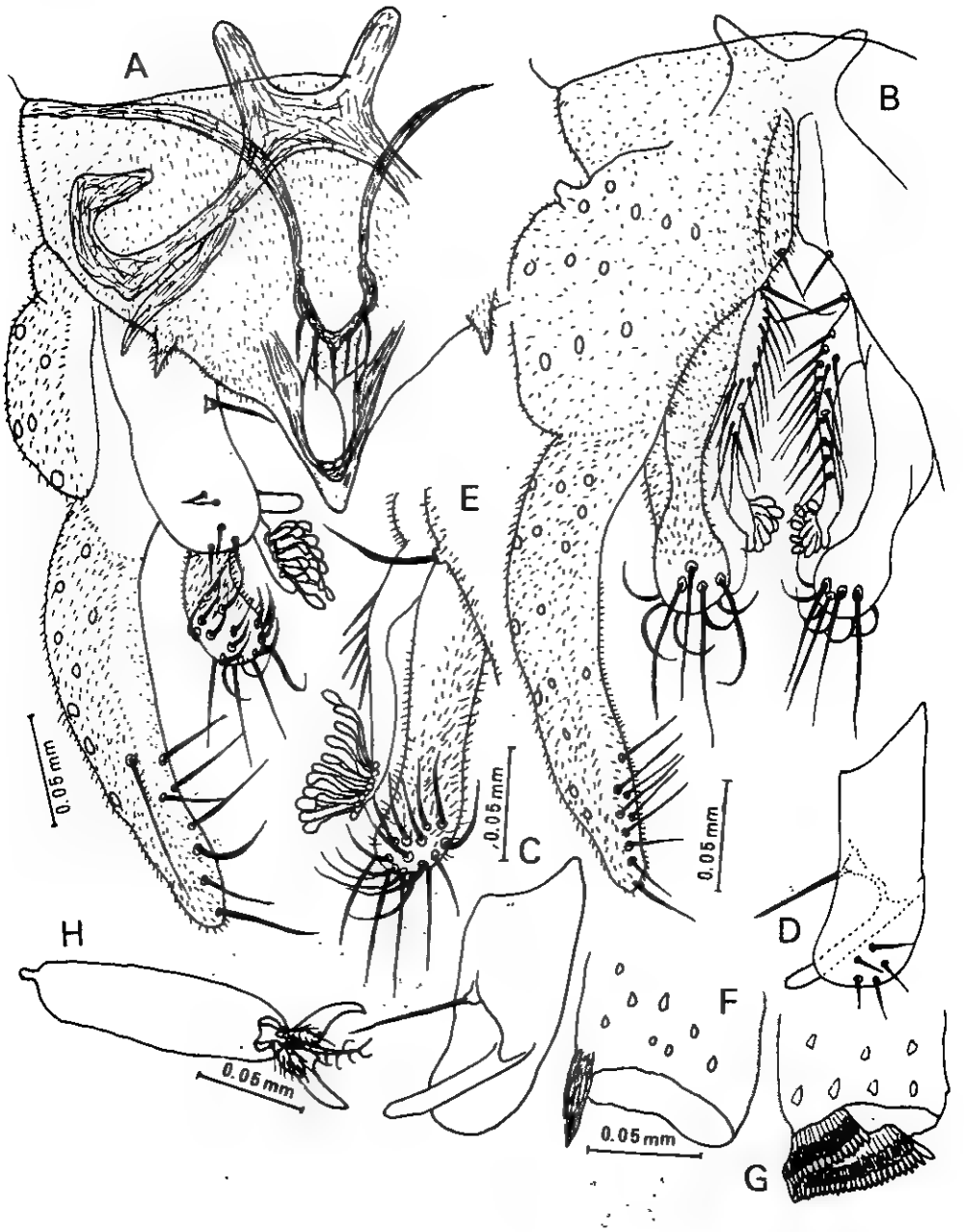

Fig. 11. ***Micropsectra chuzelonga,*** **sp. nov. Male.**

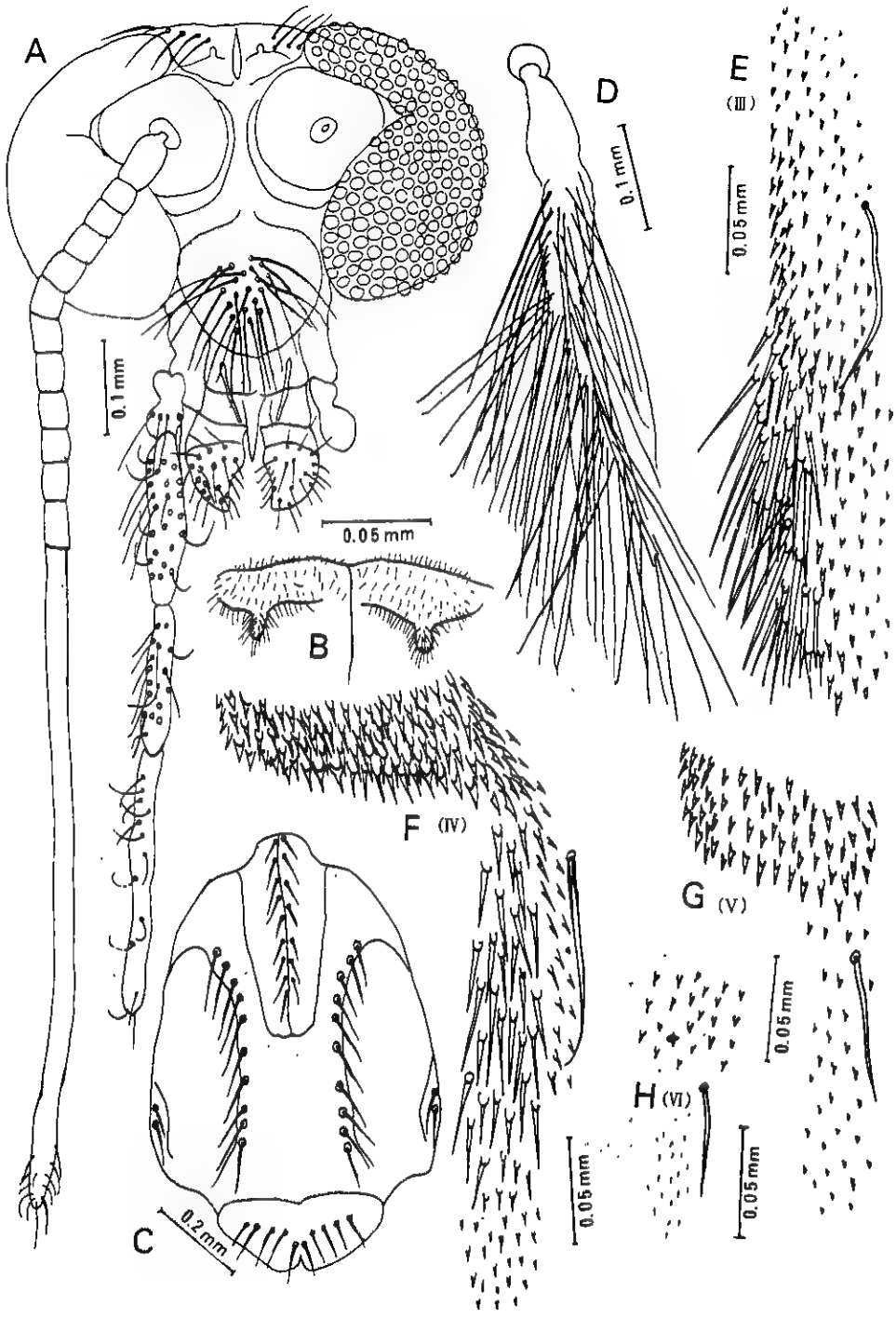

Fig. 12. *Micropsectra chuzelonga*, sp. nov.
Male(A-C),Pupa(D-H).

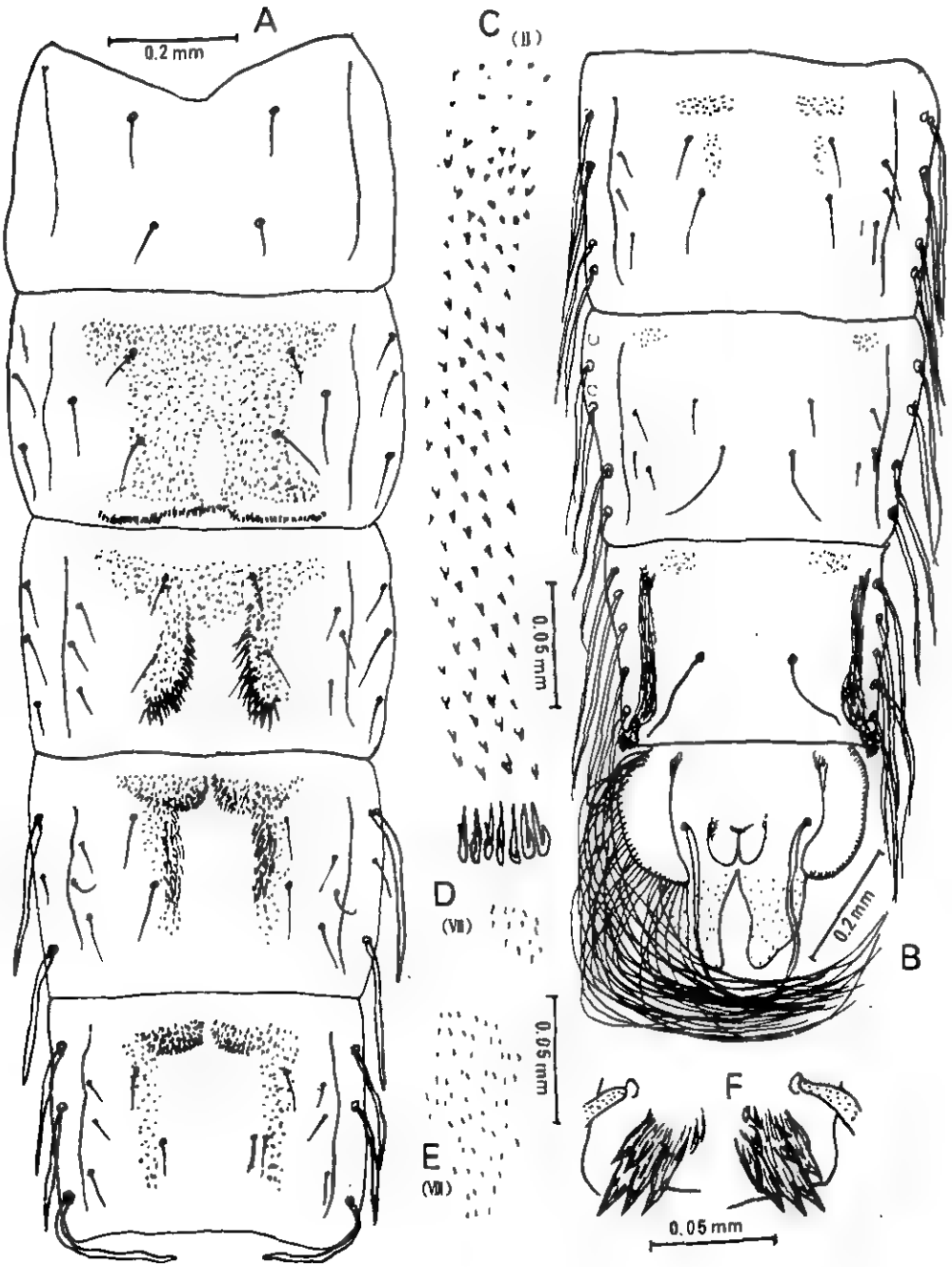

Fig. 13. ***Micropsectra chuzelonga*, sp. nov. Pupa.**

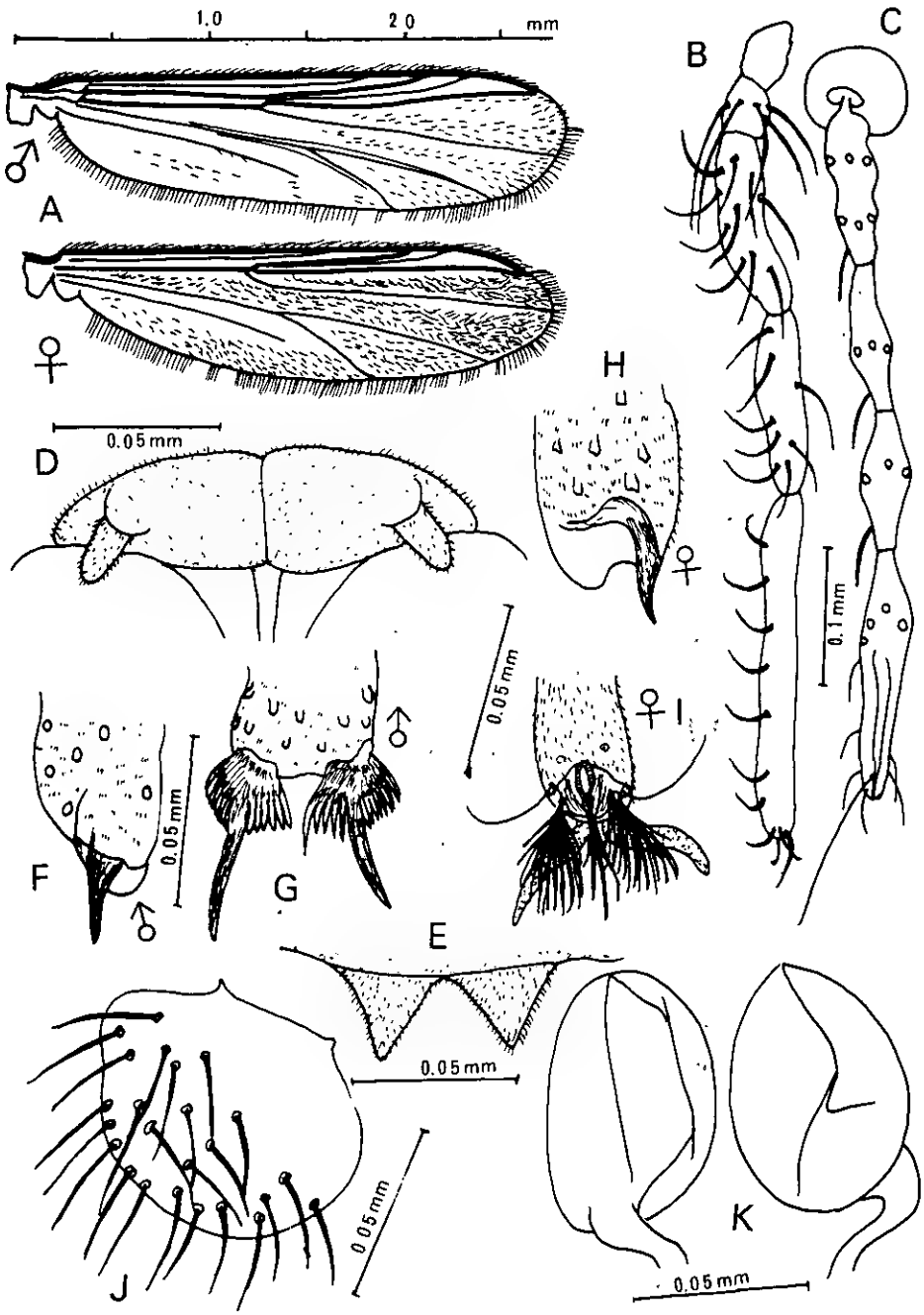

Fig. 14. ***Tanytarsus yunosecundus,*** **sp. nov. Adult.**

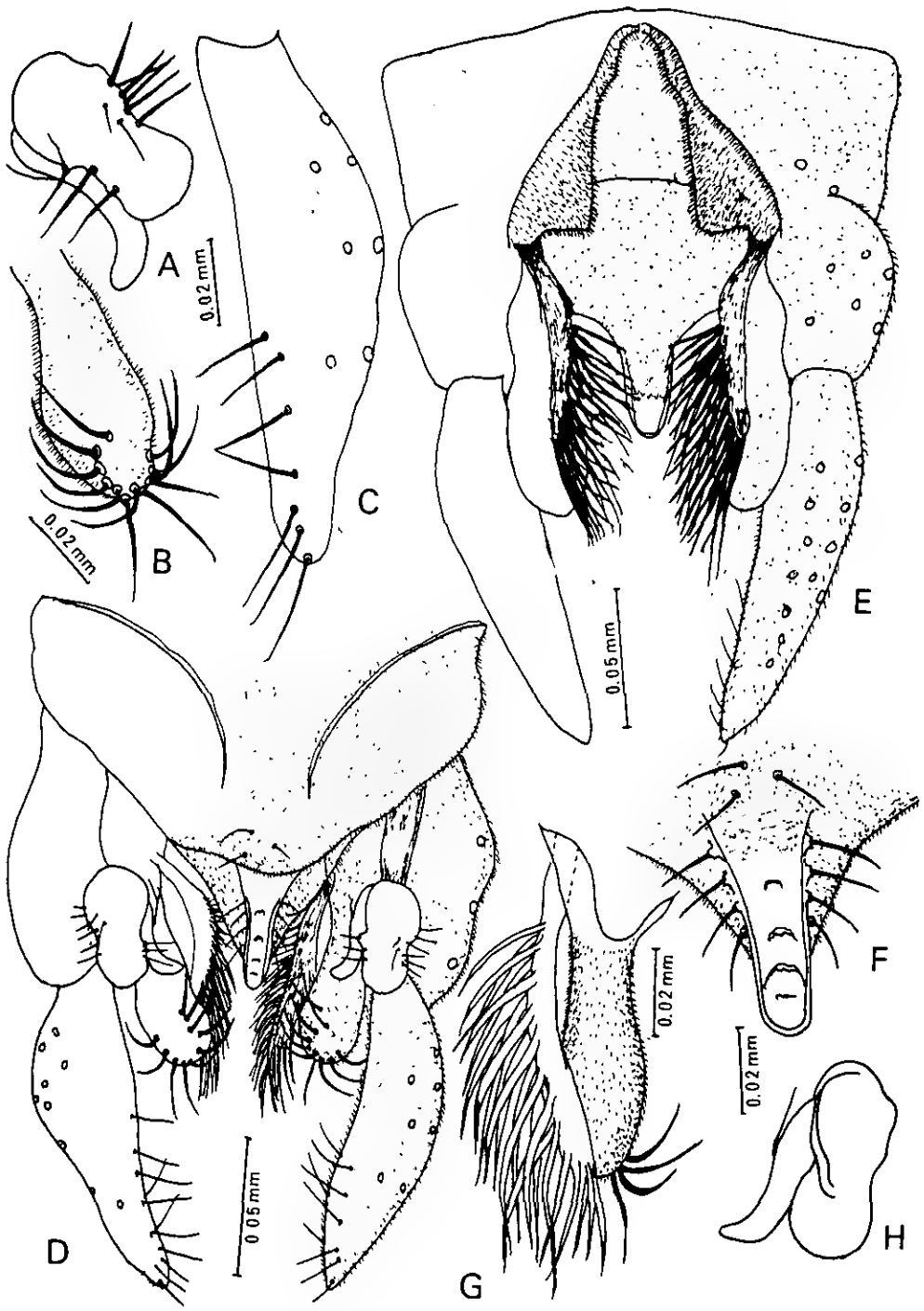

Fig. 15. ***Tanytarsus yunosecundus,*** **sp. nov. Male.**

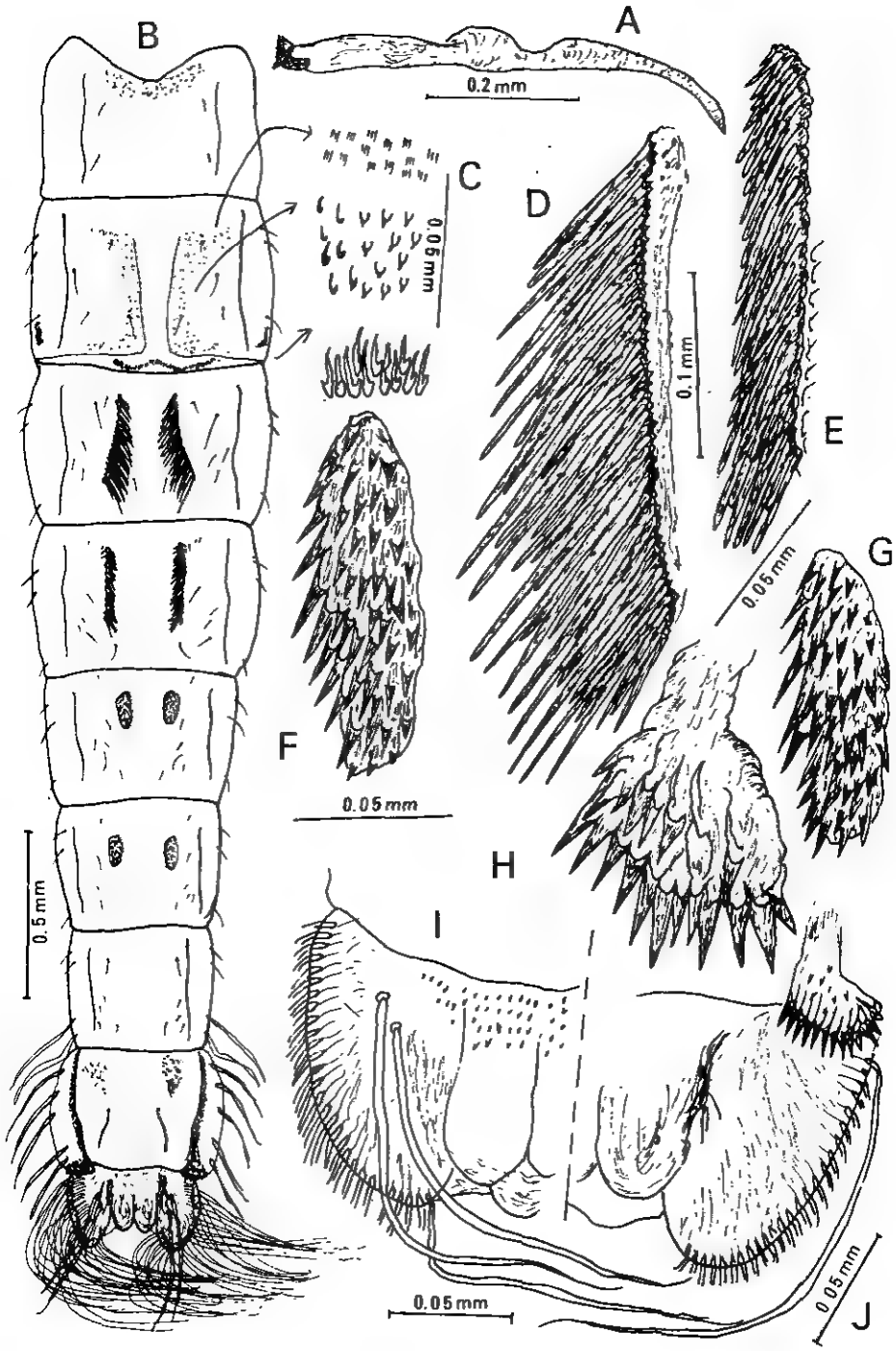

Fig. 16. ***Tanytarsus yunosecundus,*** **sp. nov. Pupa.**

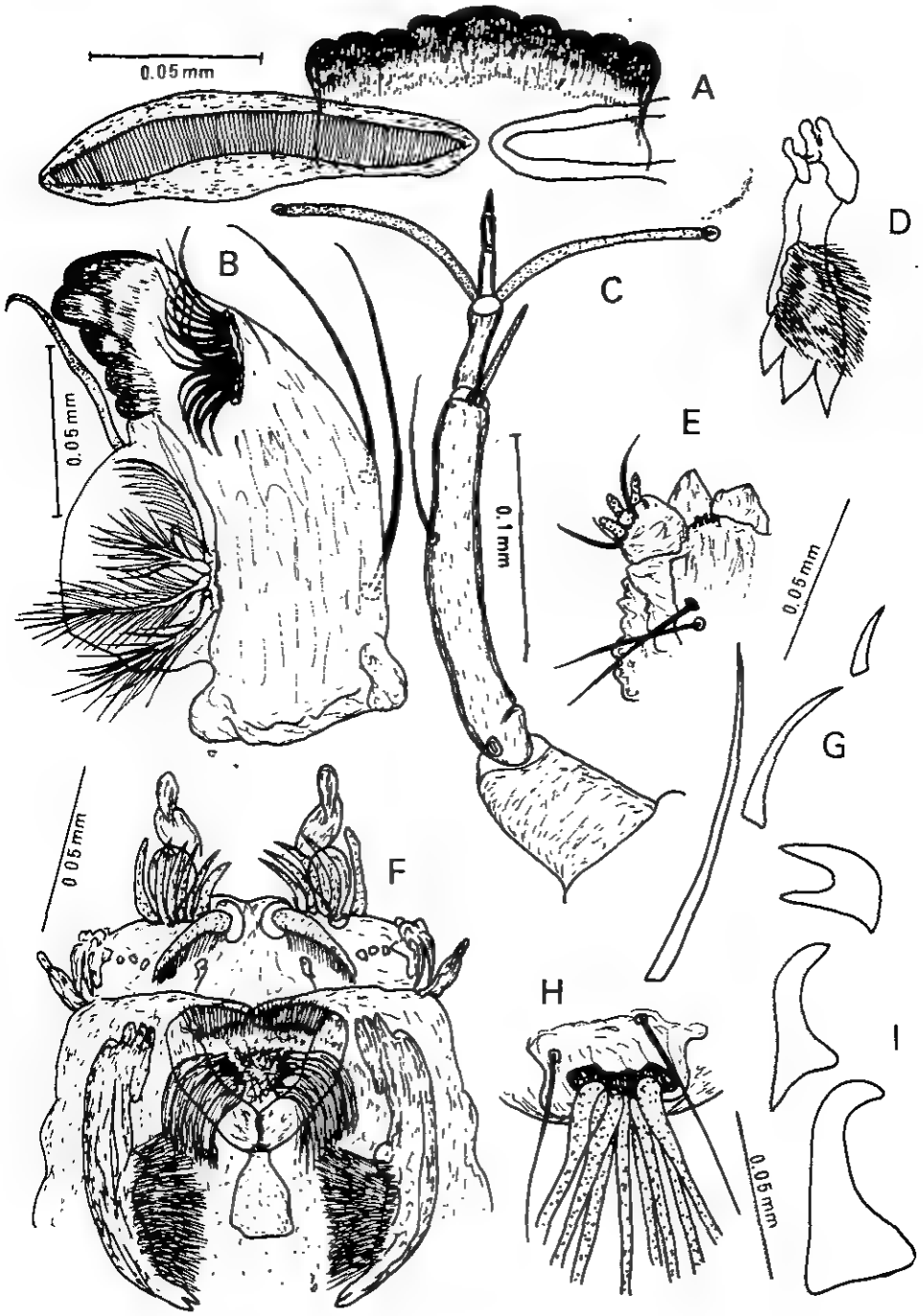

Fig. 17. ***Tanytarsus yunosecundus*, sp. nov. Larva.**

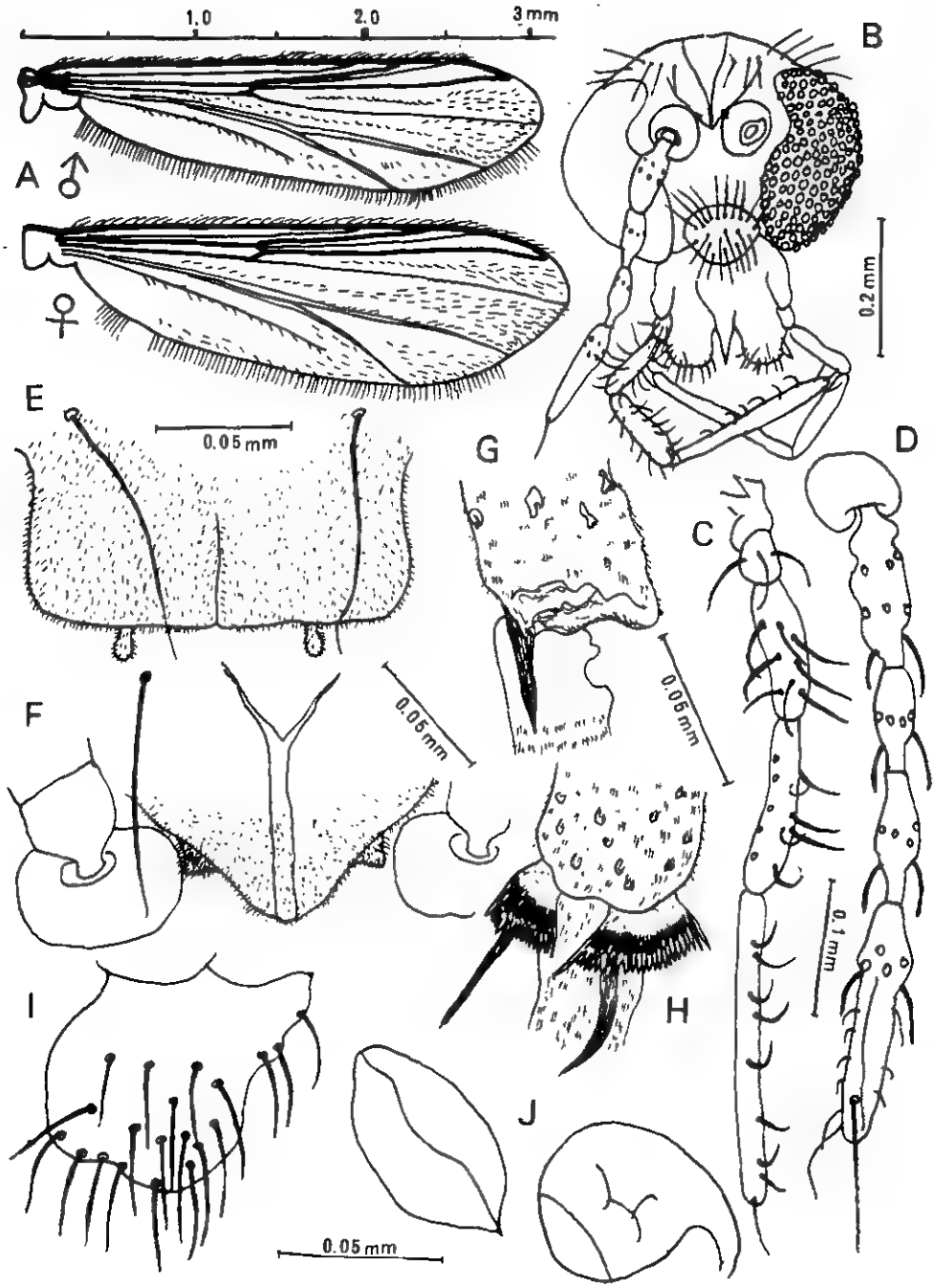

Fig. 18. ***Tanytarsus chuzesecundus,*** **sp. nov. Adult.**

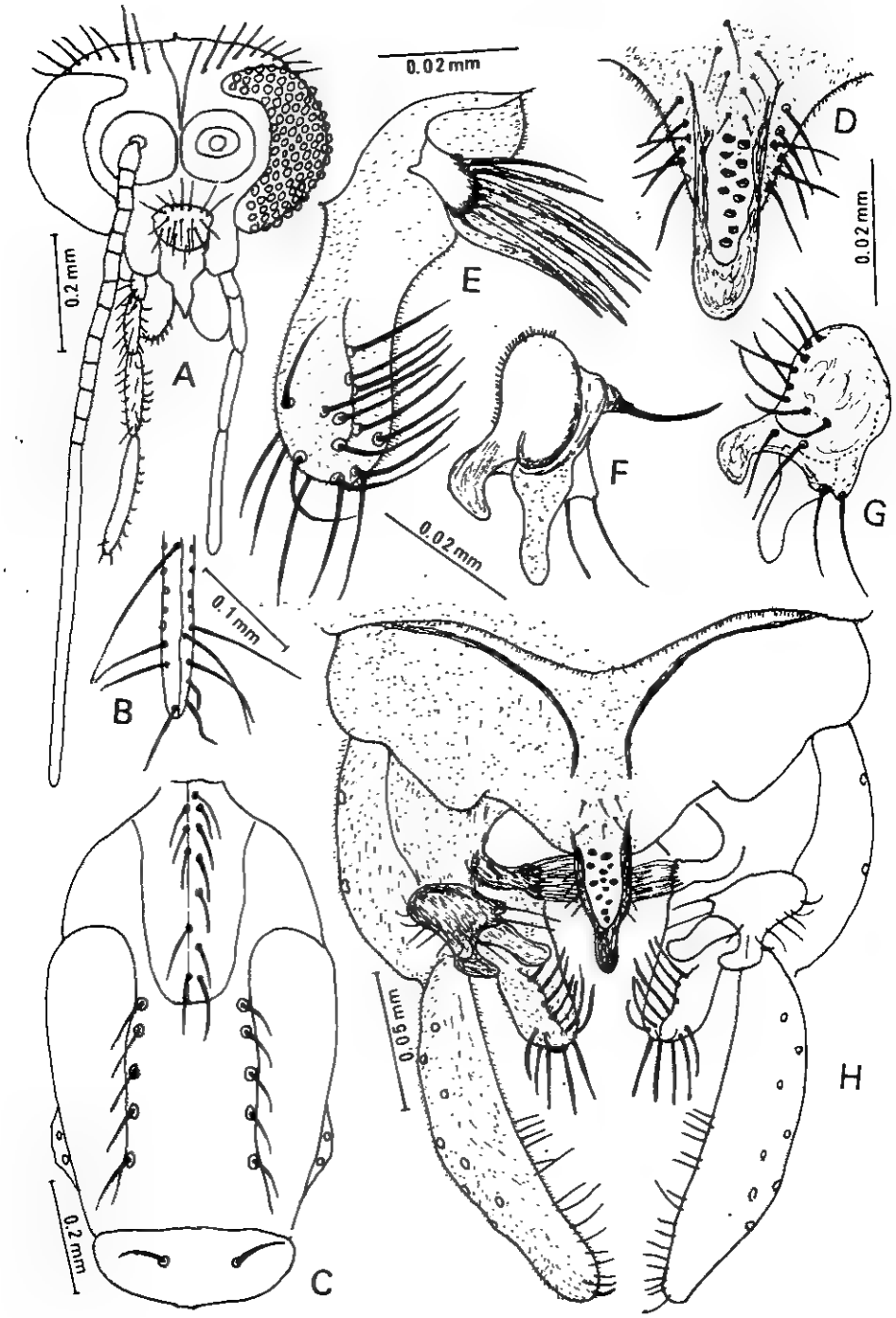

Fig. 19. ***Tanytansas chuzesecundus,*** **sp. nov. Male.**

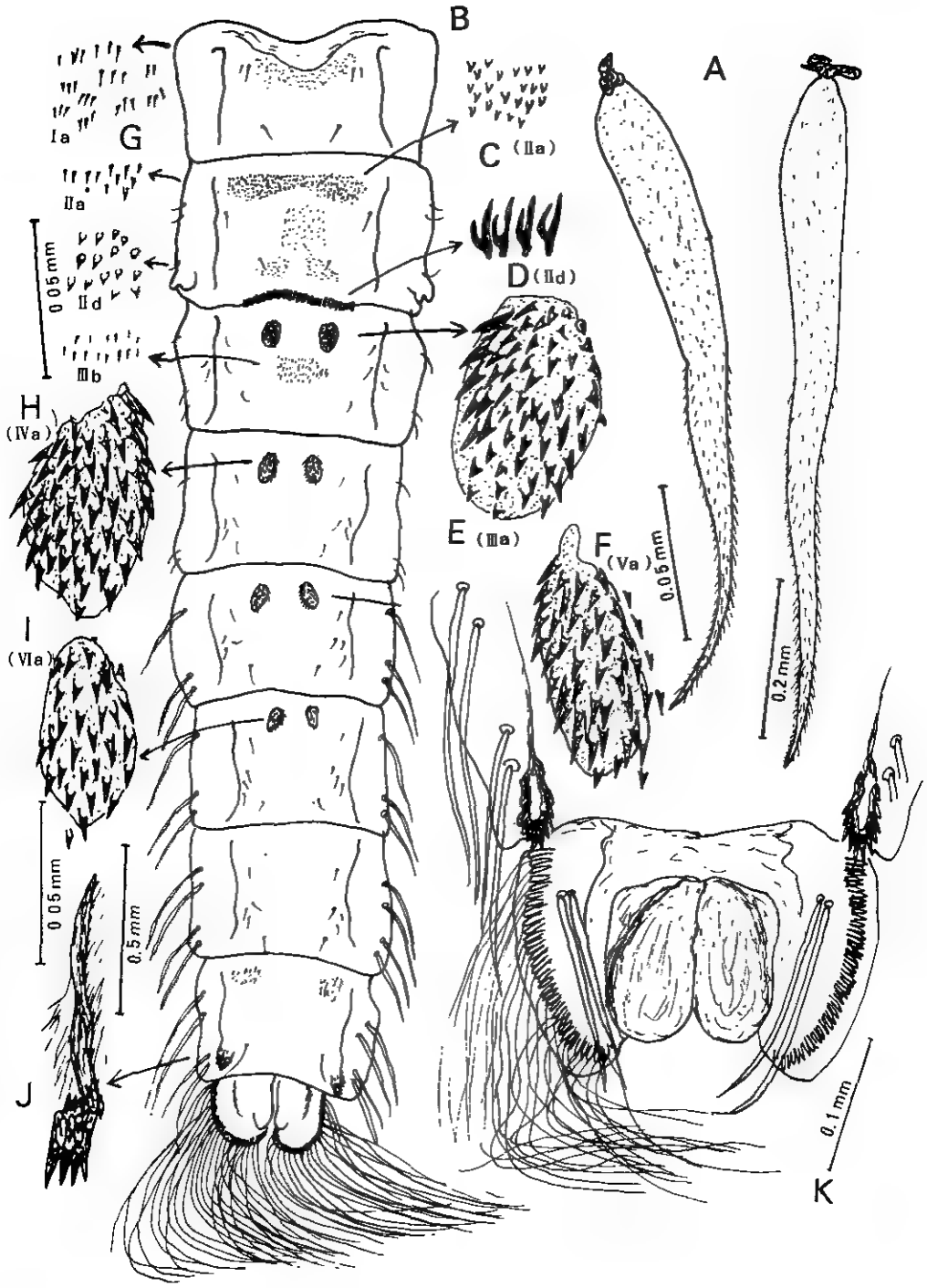

Fig. 20. ***Tanytarsus chuzesecundus,*** **sp. nov. Pupa.**

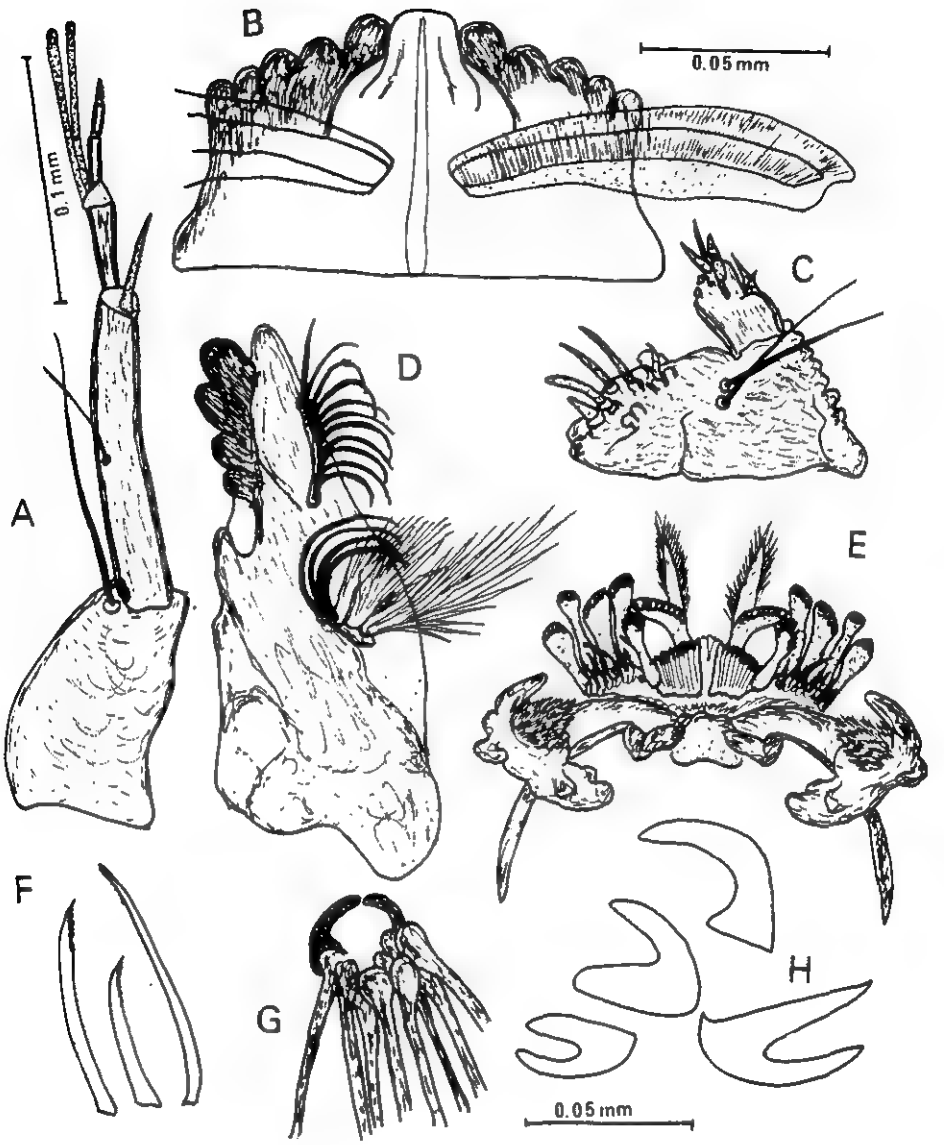

Fig. 21. ***Tanytarsus chuzesecundus*, sp. nov. Larva.**

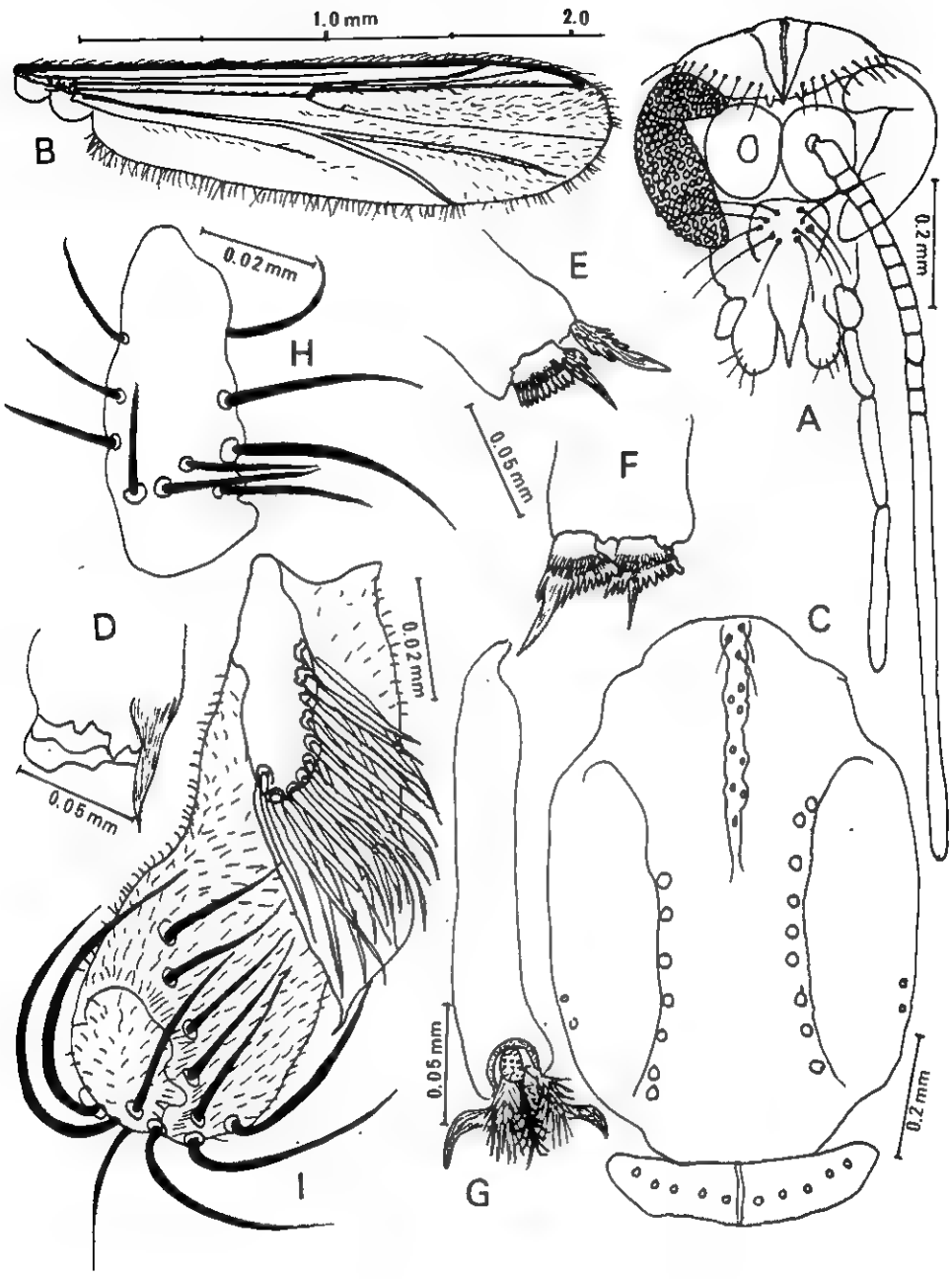

Fig. 22. ***Tanytarsus gregarius,*** **Kieffer. Male.**

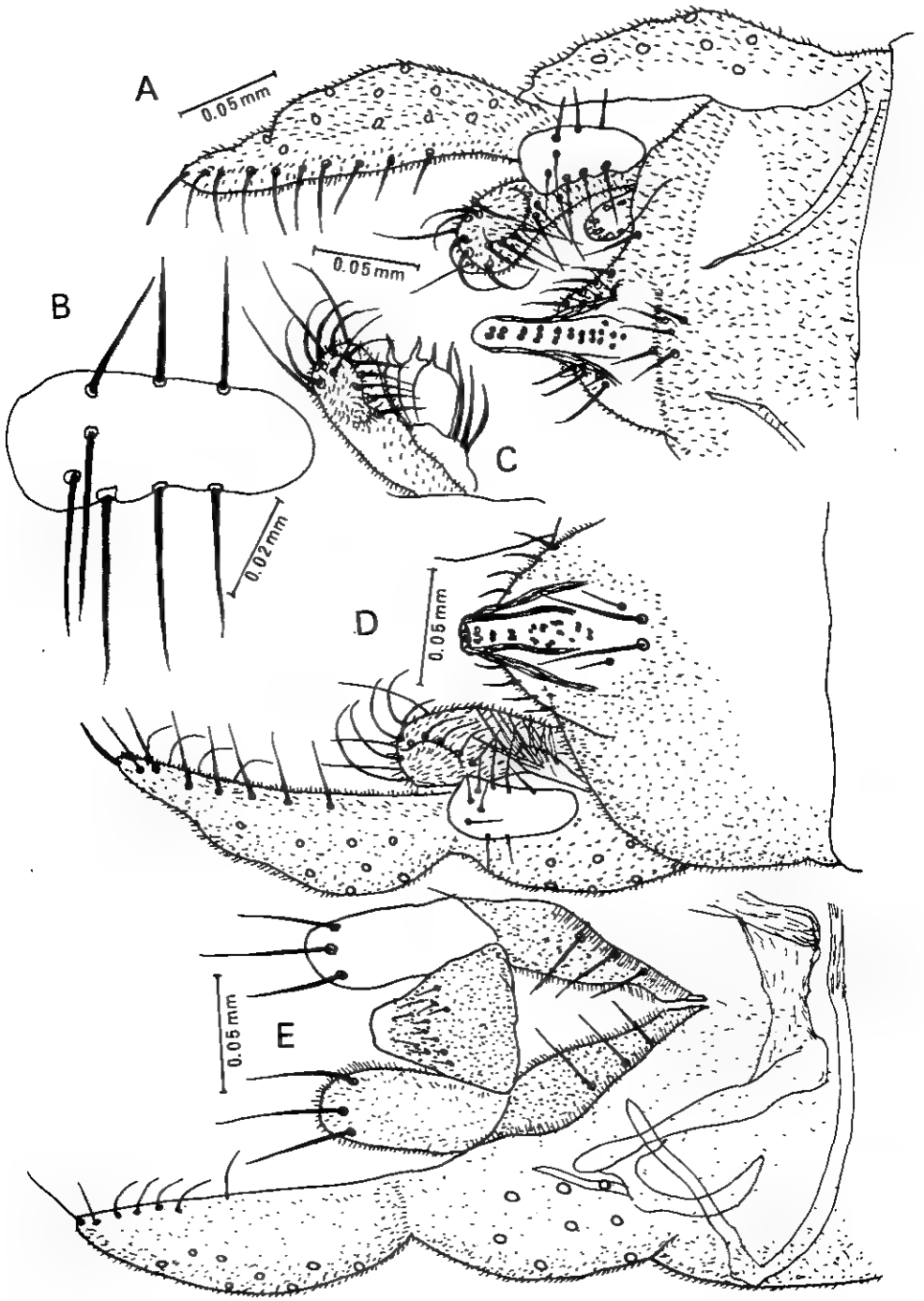

Fig. 23. ***Tanytarsus gregarius,*** **Kieffer. Male.**

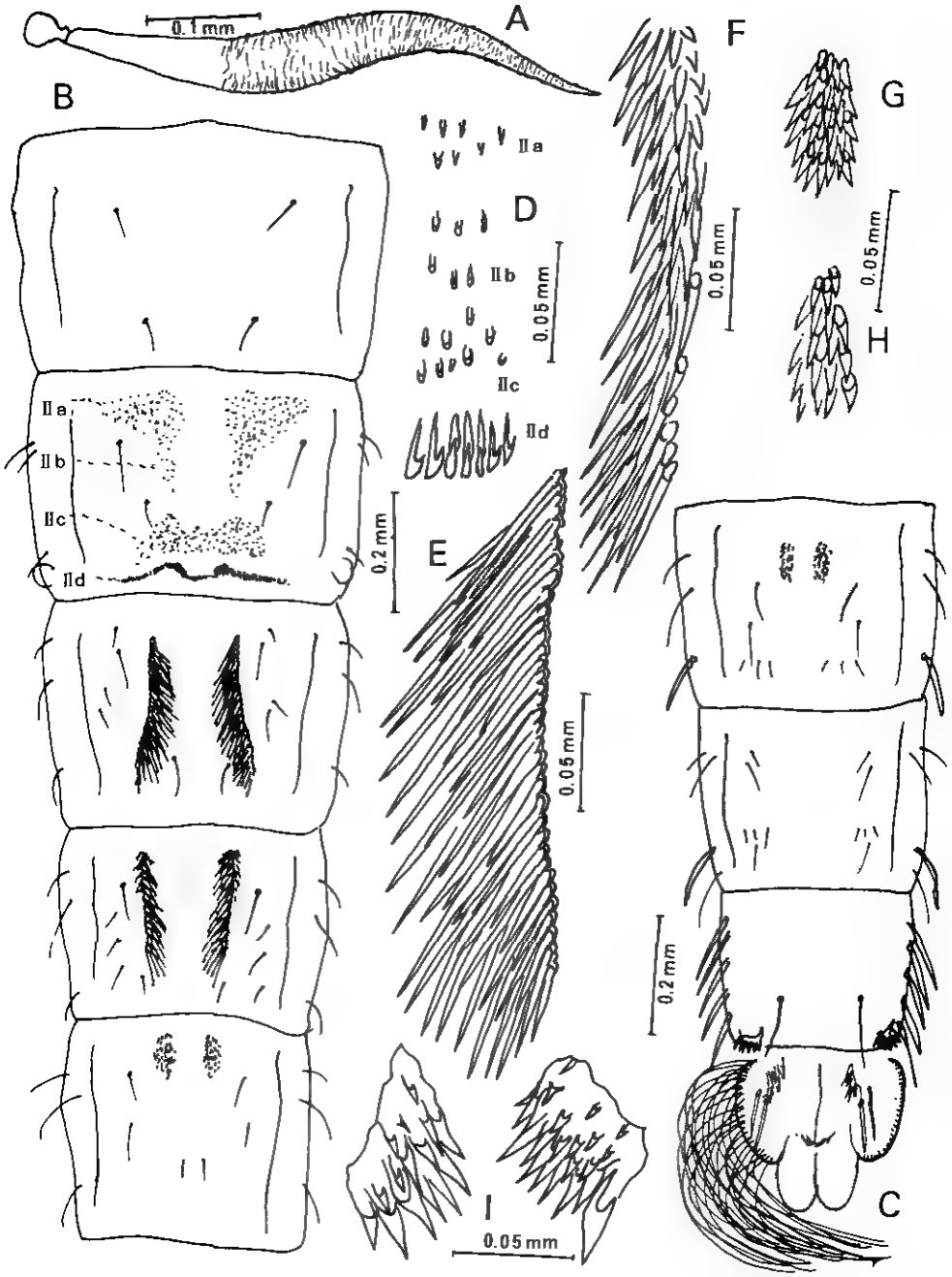

Fig. 24. ***Tanytarsus gregarius,*** **Kieffer. Pupa.**

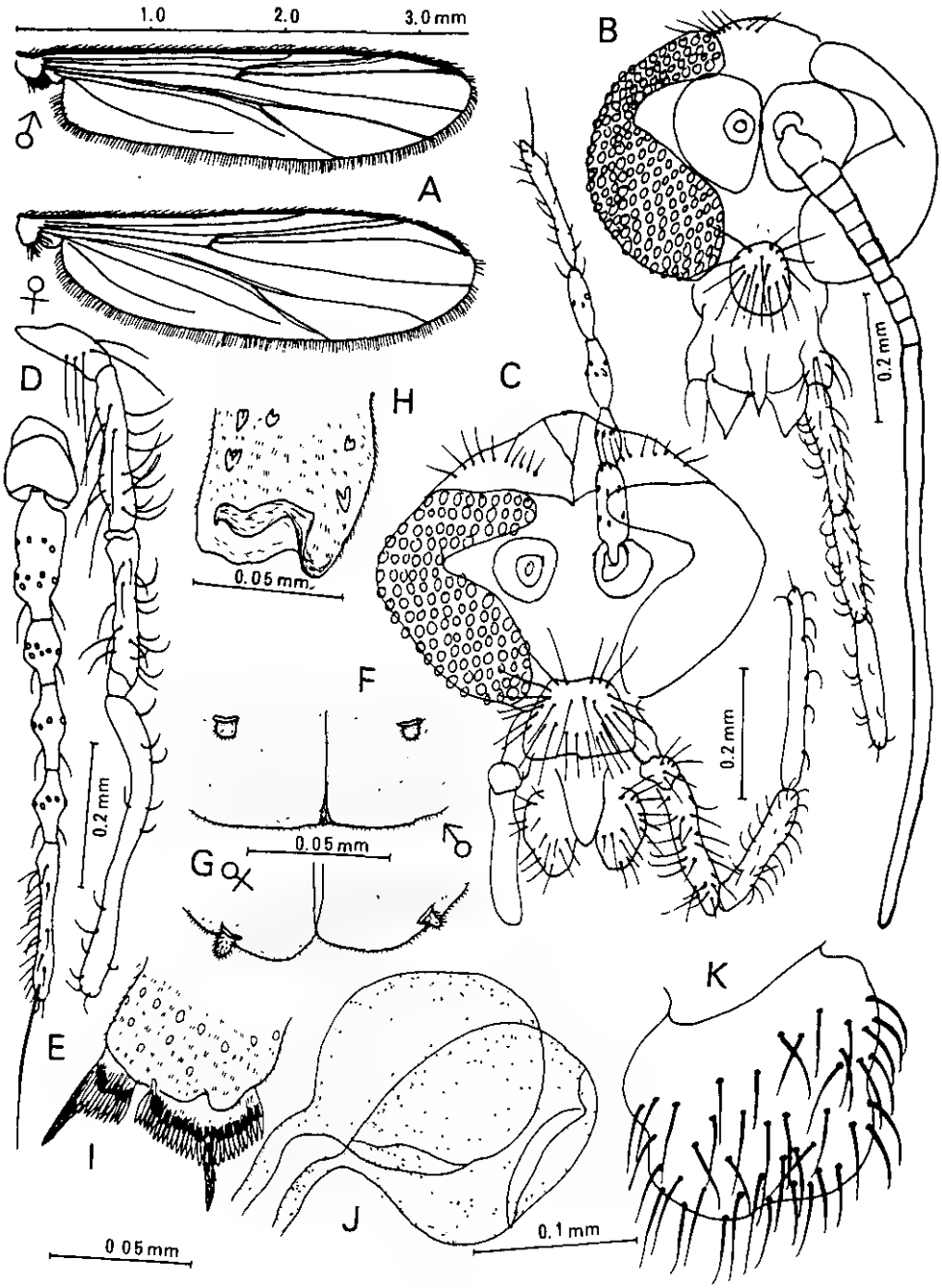

Fig. 25. ***Dicrotendipes lobiger,*** **(Kieffer). Adult.**

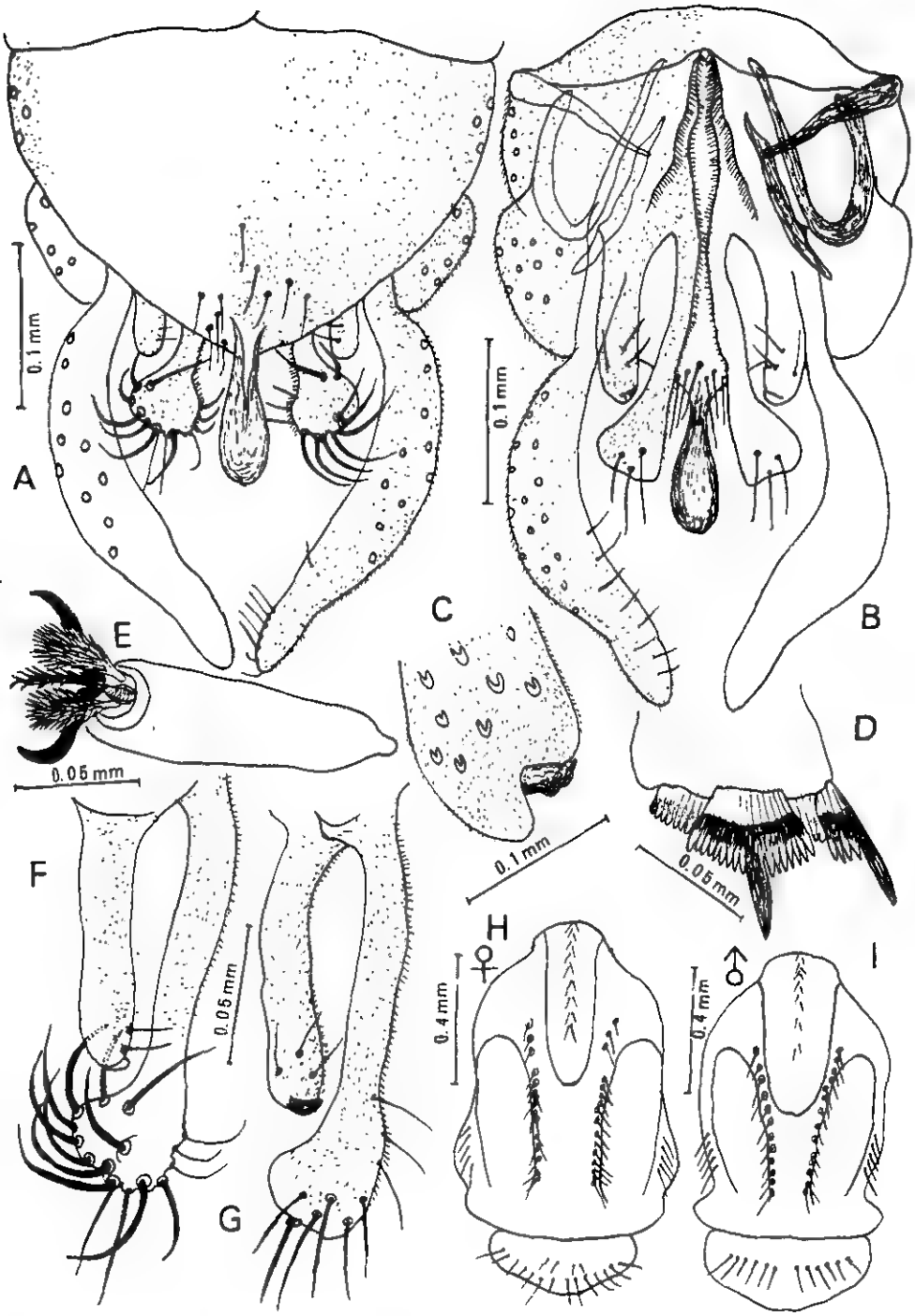

Fig. 26. *Dicrotendipes lobiger*, (Kieffer). Adult.

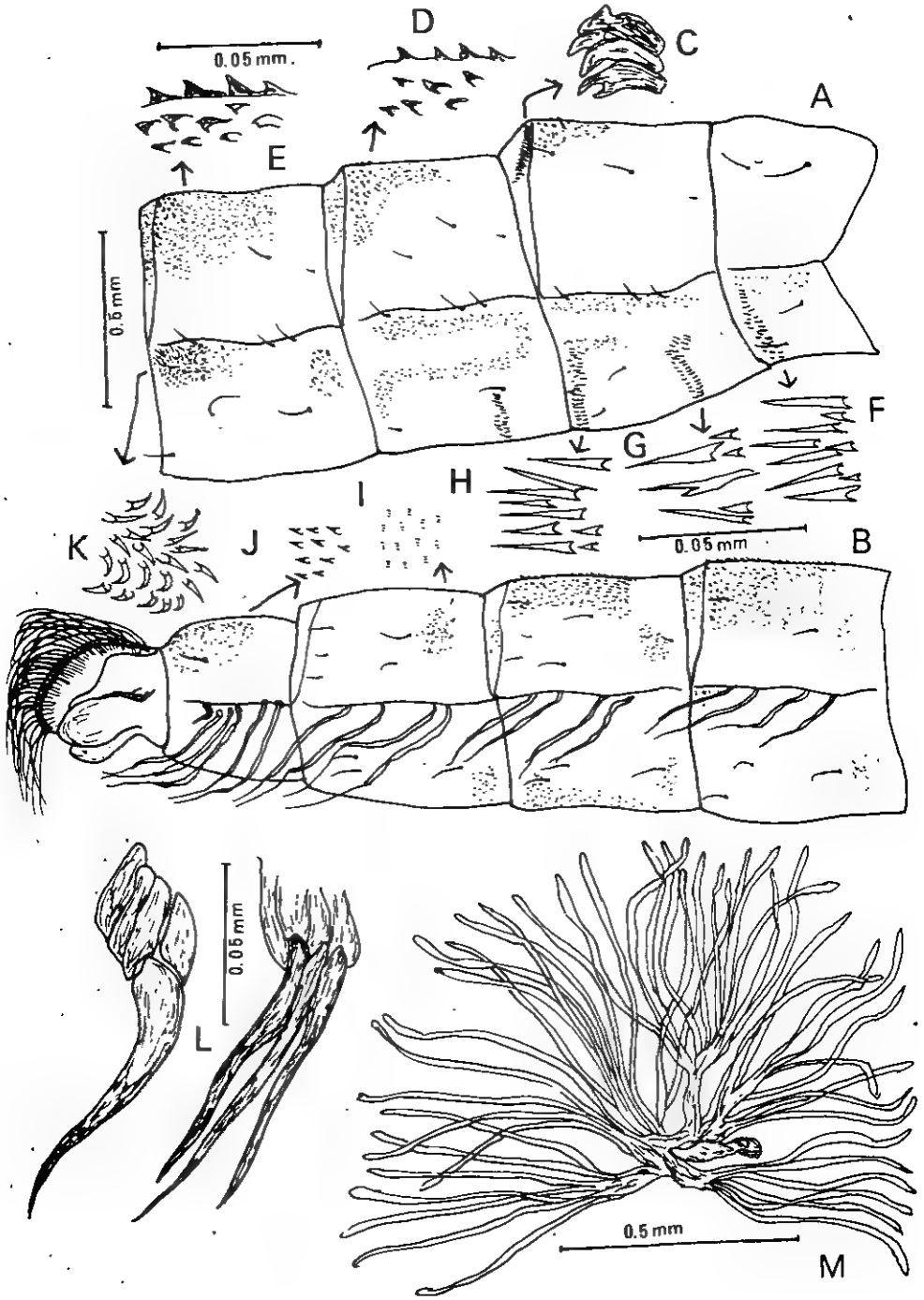

Fig. 27. *Dicrotendipes lobiger,* (Kieffer). Pupa.

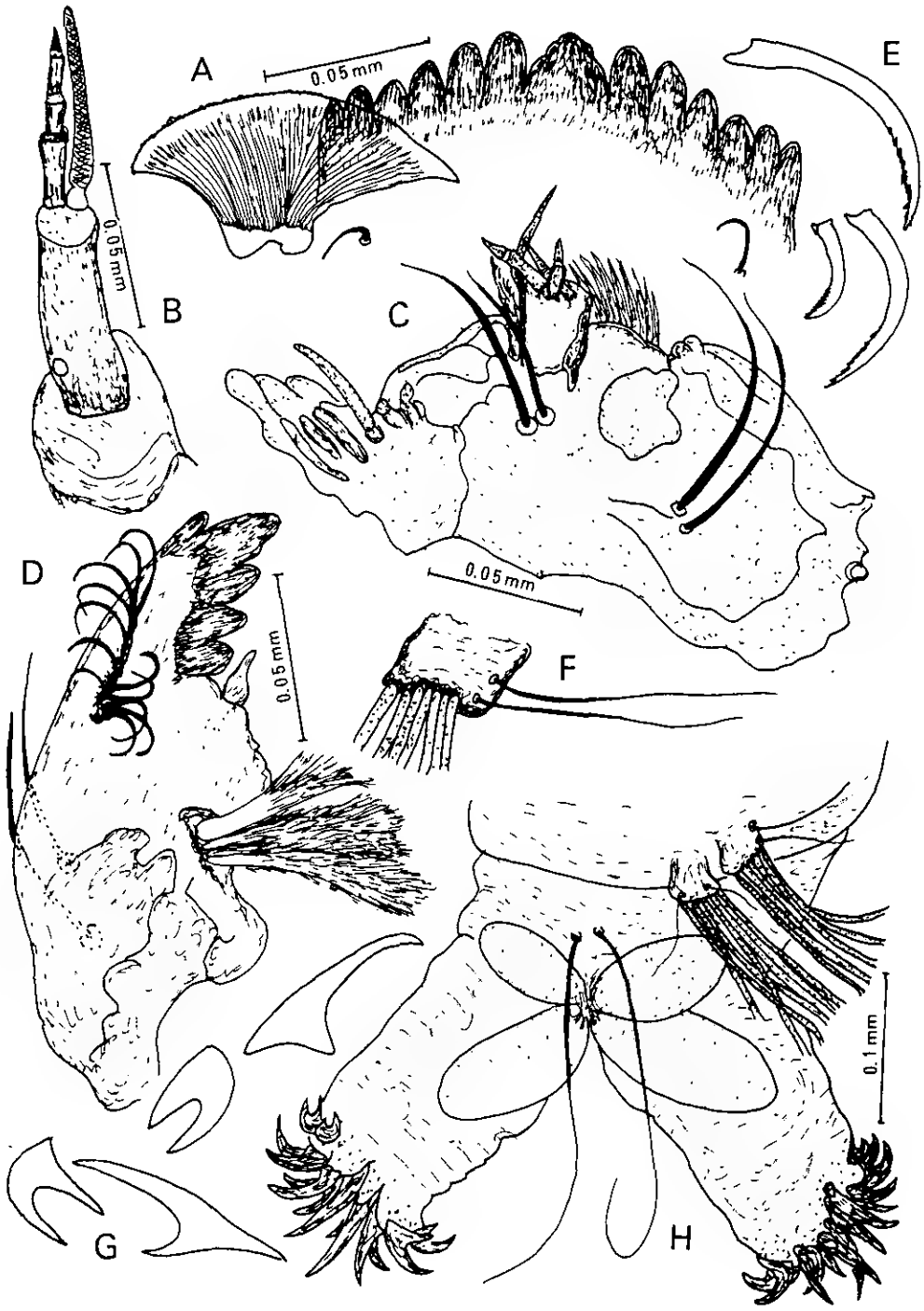

Fig. 28. *Dicrotendipes lobiger,* (Kieffer). Larva.

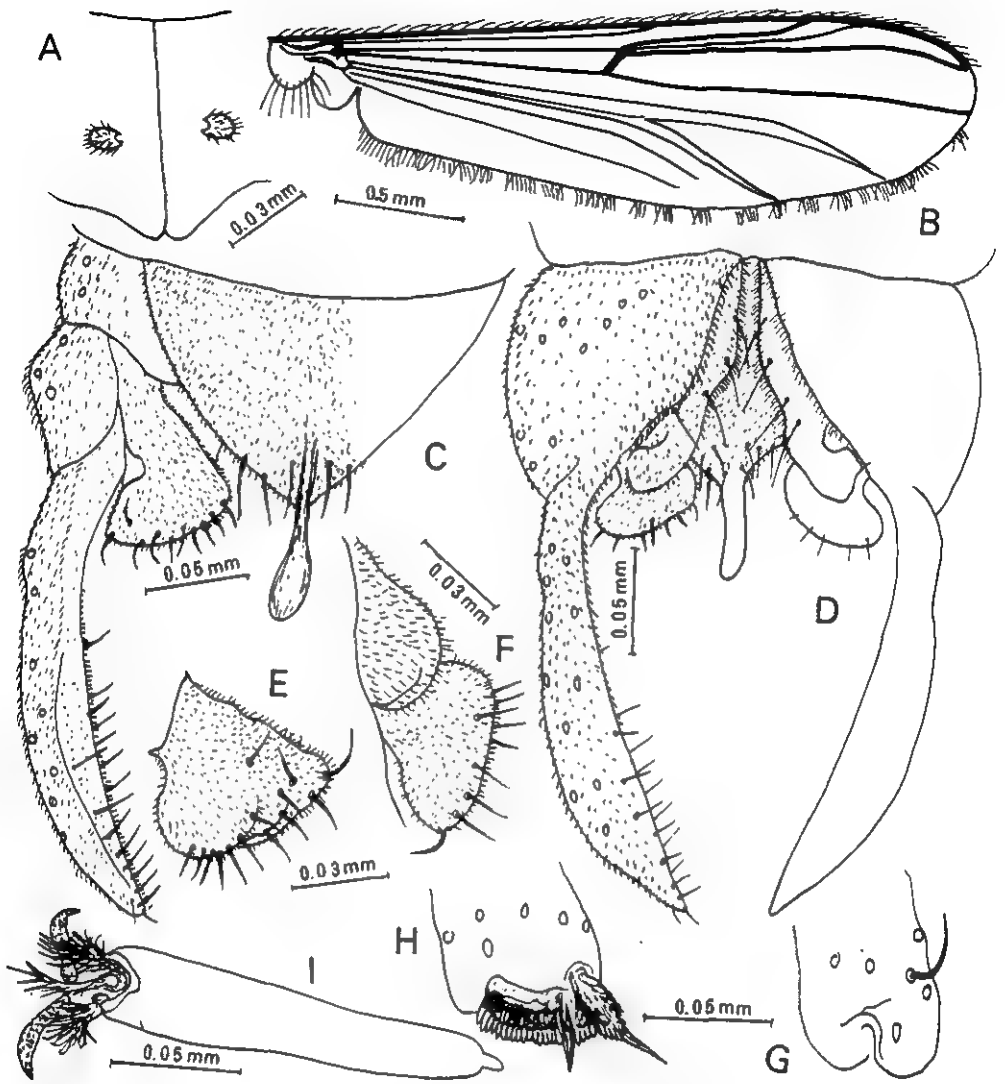

Fig. 29. ***Paracladopelma camptolabis,*** **Kieffer. Male.**

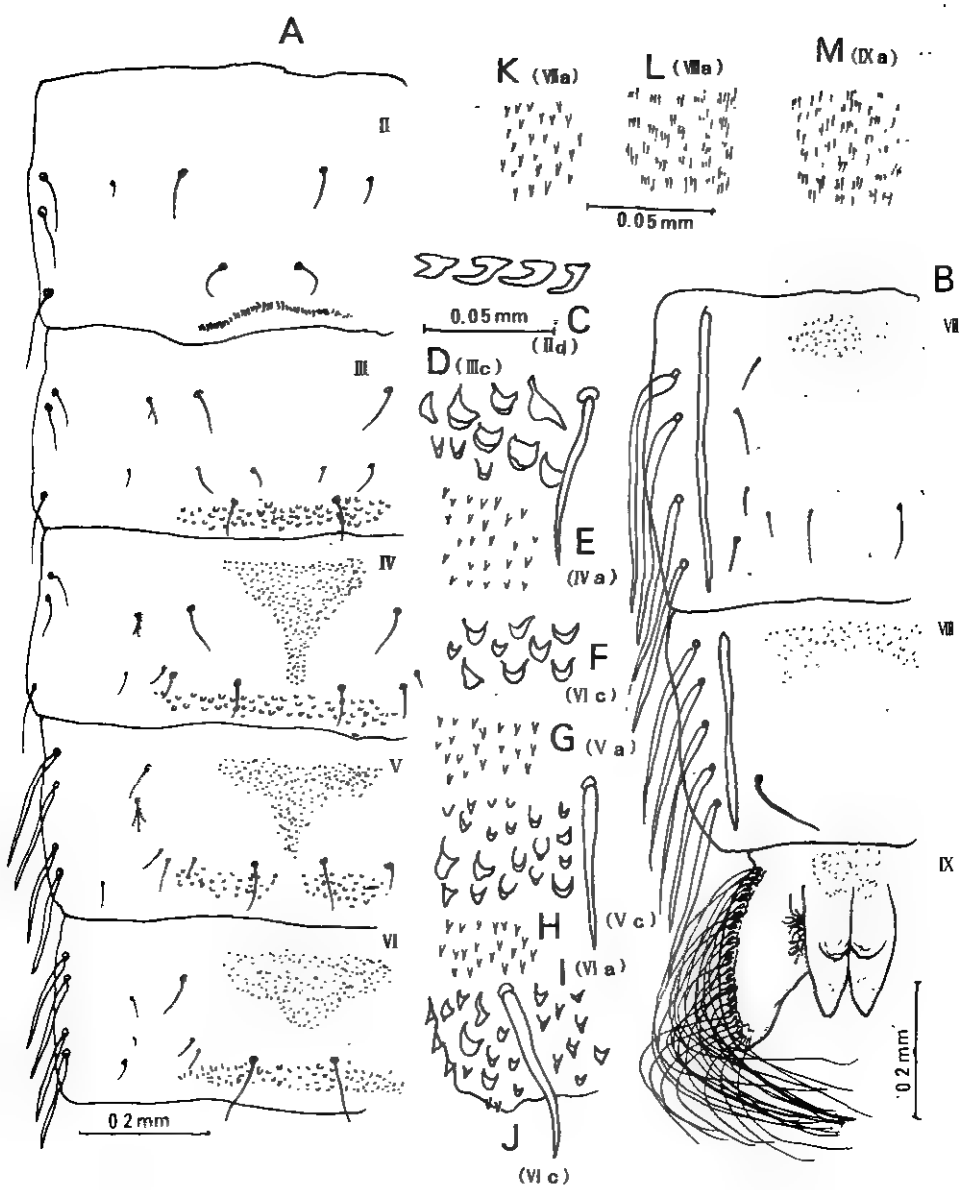

Fig. 30. ***Paracladopelma camptolabis,*** **Kieffer. Pupa.**

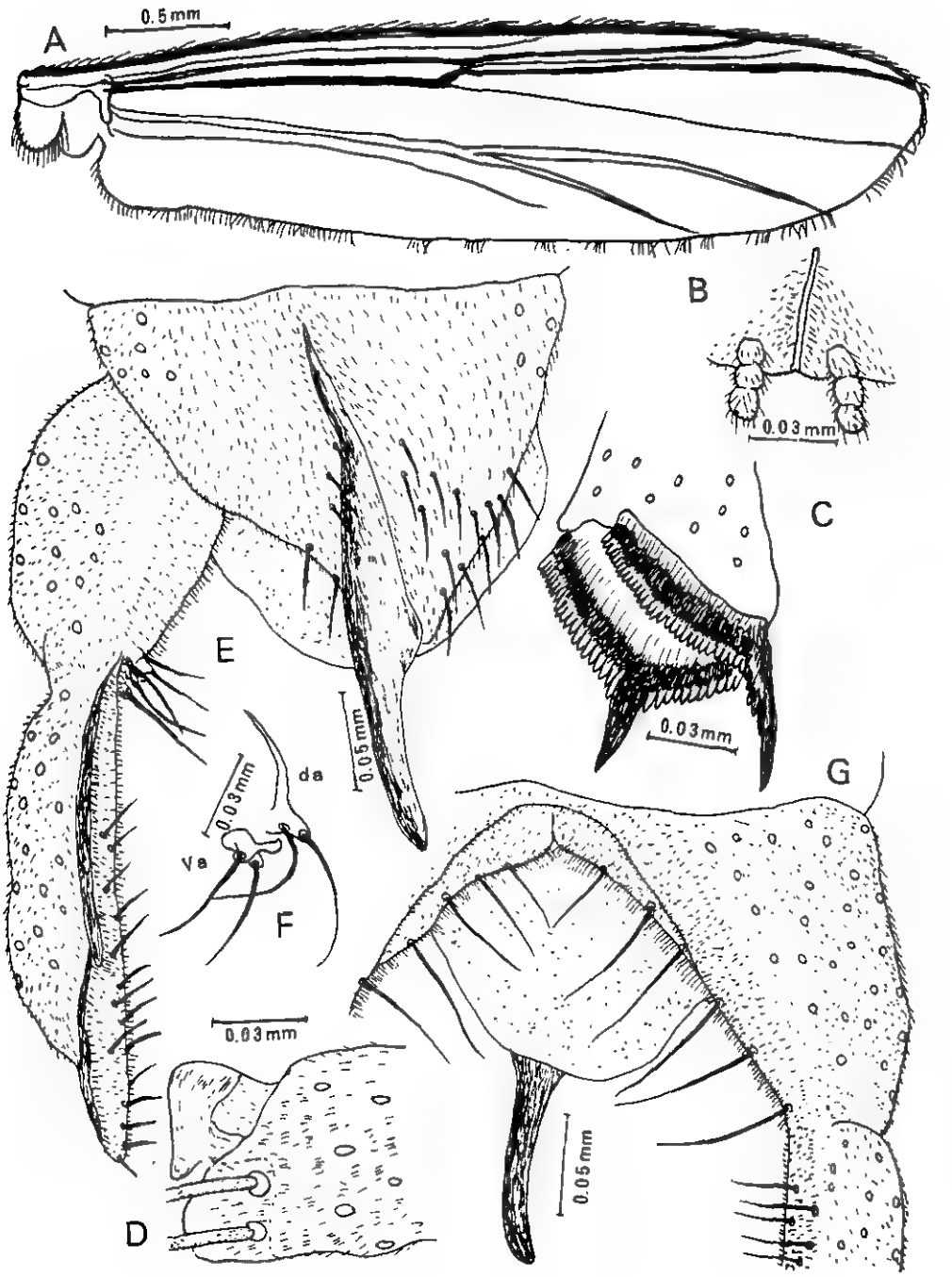

Fig. 31. ***Demicriptochironomus chuzequartus,*** **sp. nov. Male.**

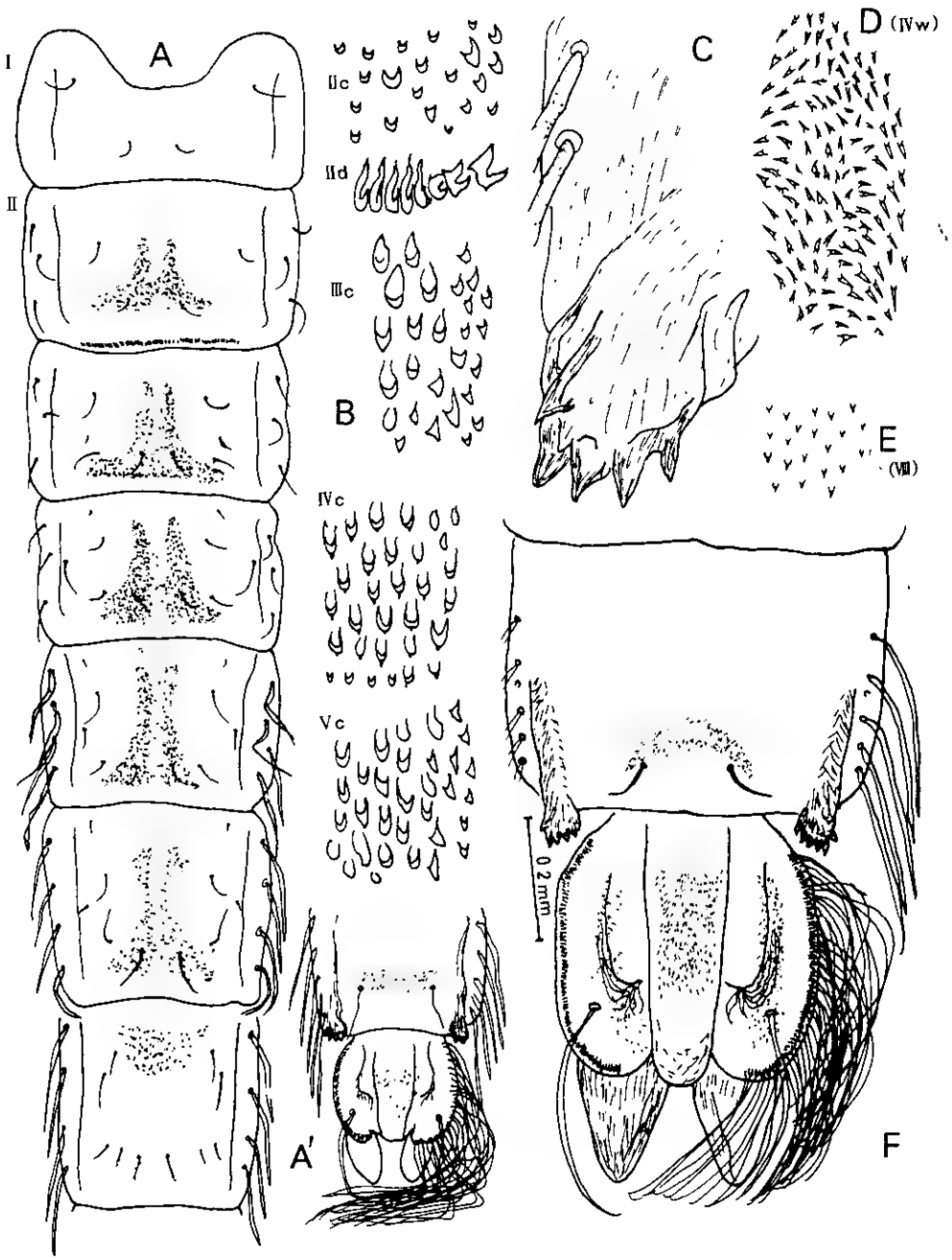

Fig. 32. ***Demicriptochironomus chuzequartus*, sp. nov. Pupa.**

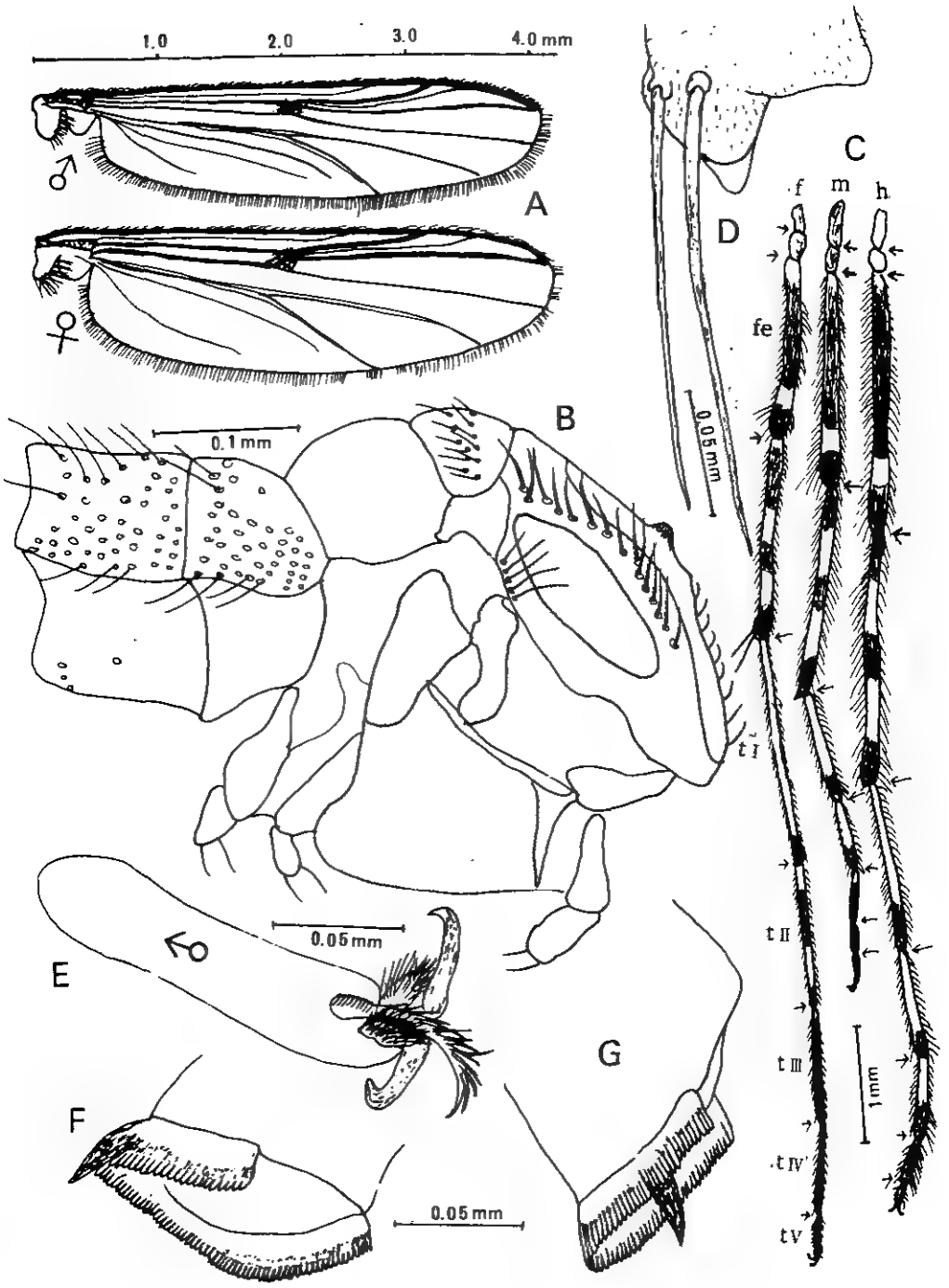

Fig. 33. ***Stictochironomus akizukii,*** **(Tokunaga). Adult.**

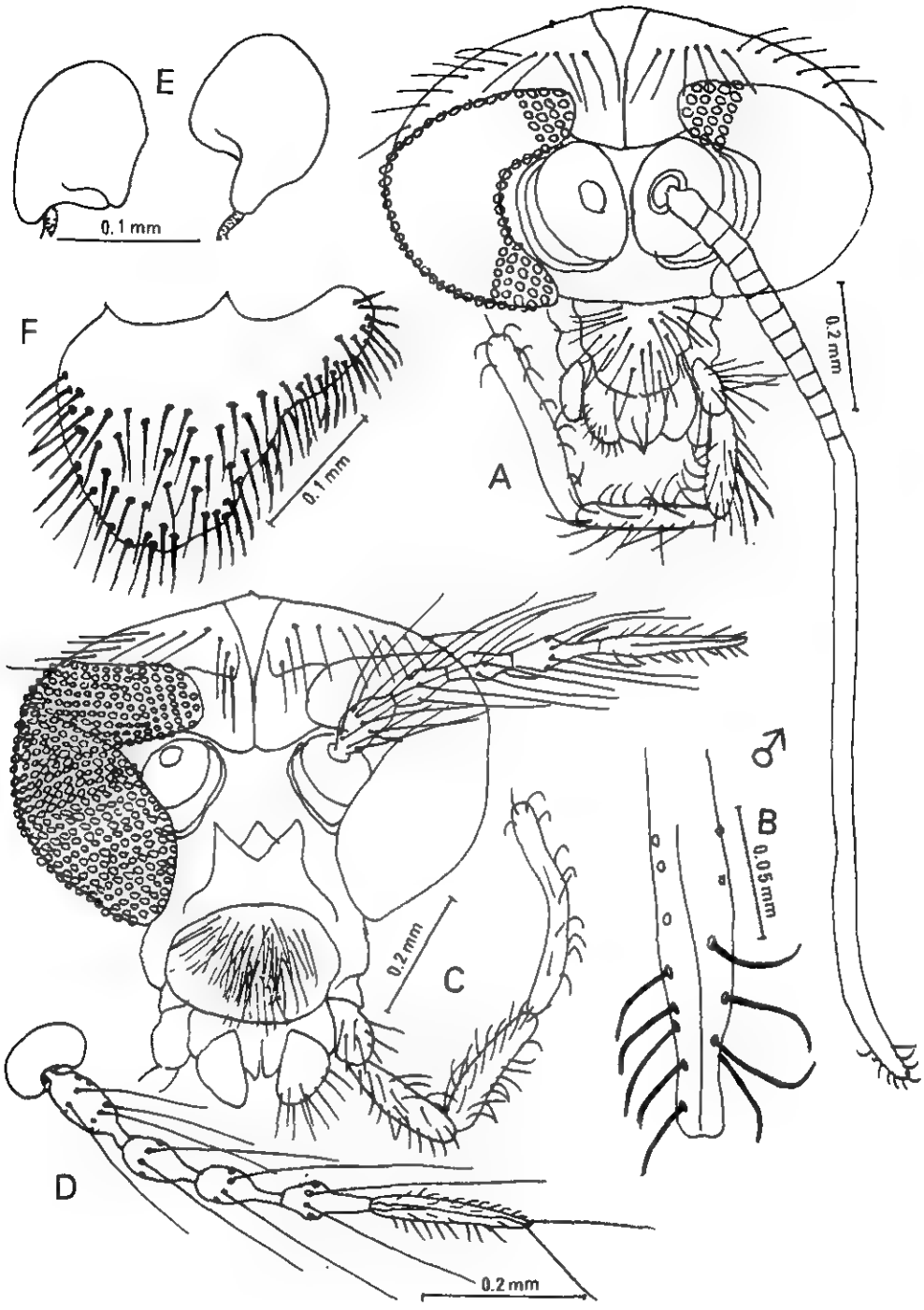

Fig. 34. *Stictochironomus akizukii,* (Tokunaga). Adlult.

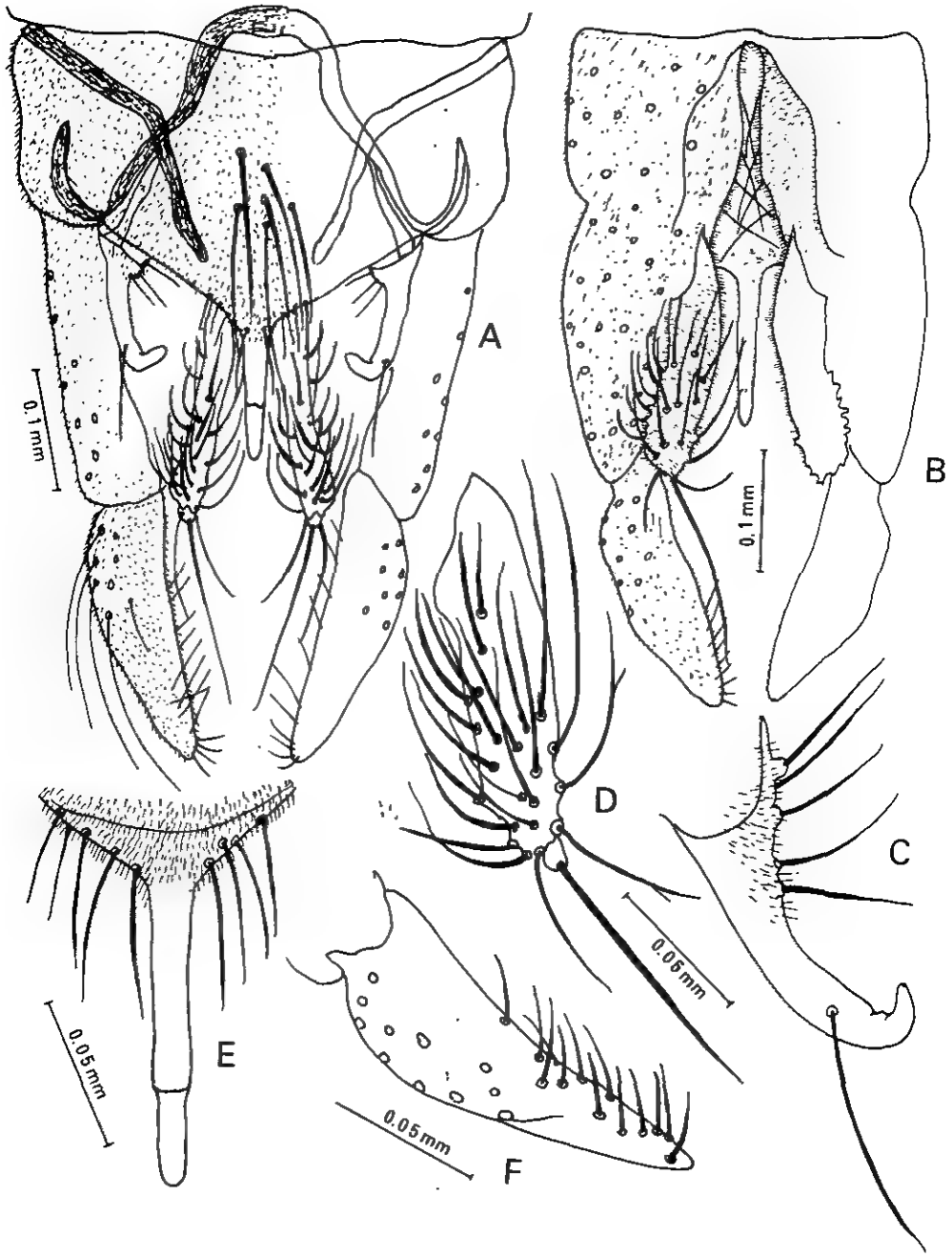

Fig. 35. ***Stictochironomus akizukii,*** **(Tokunaga).Male.**

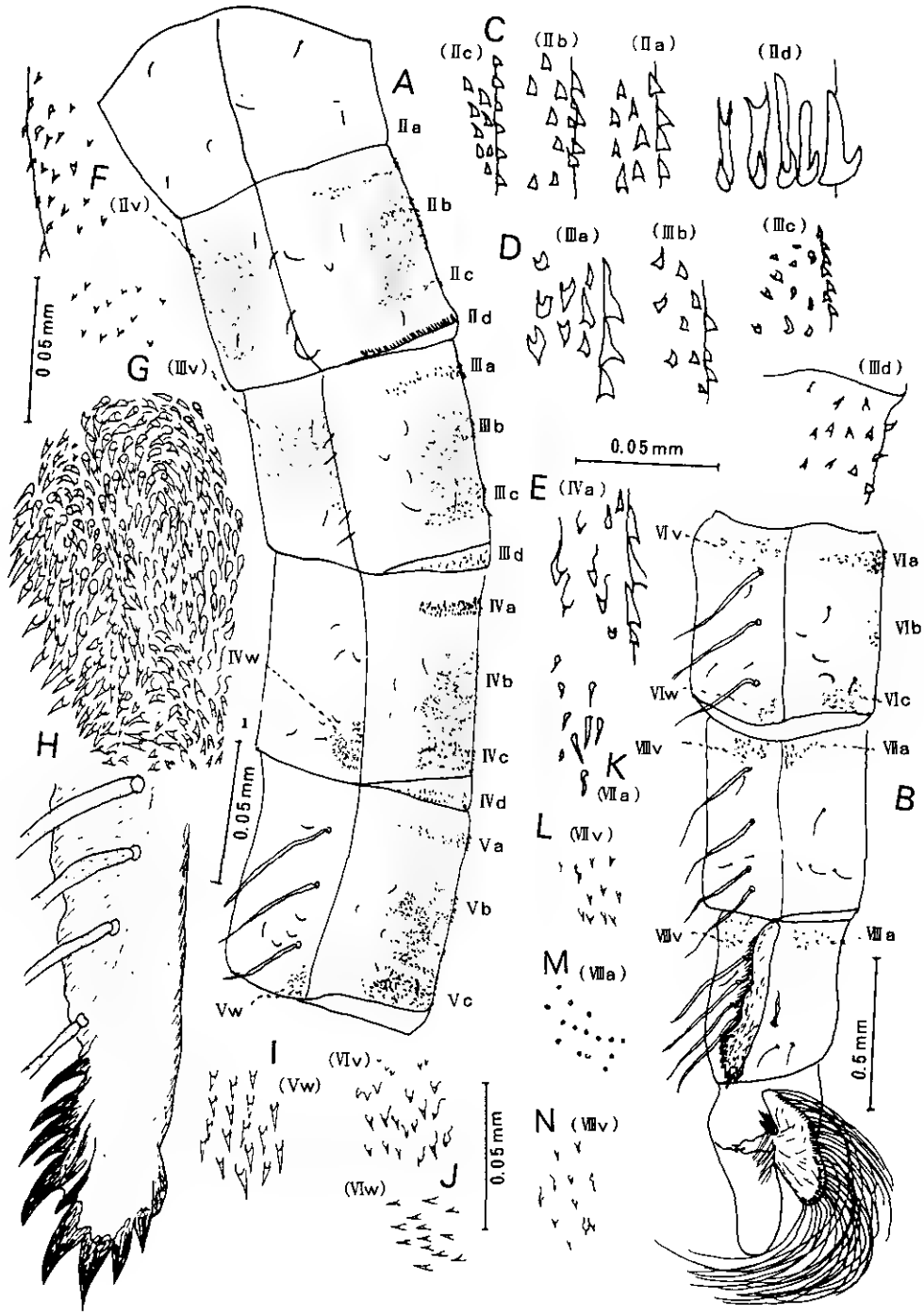

Fig. 36. ***Stictochironomus akizukii,*** **(Tokunaga).Pupa.**

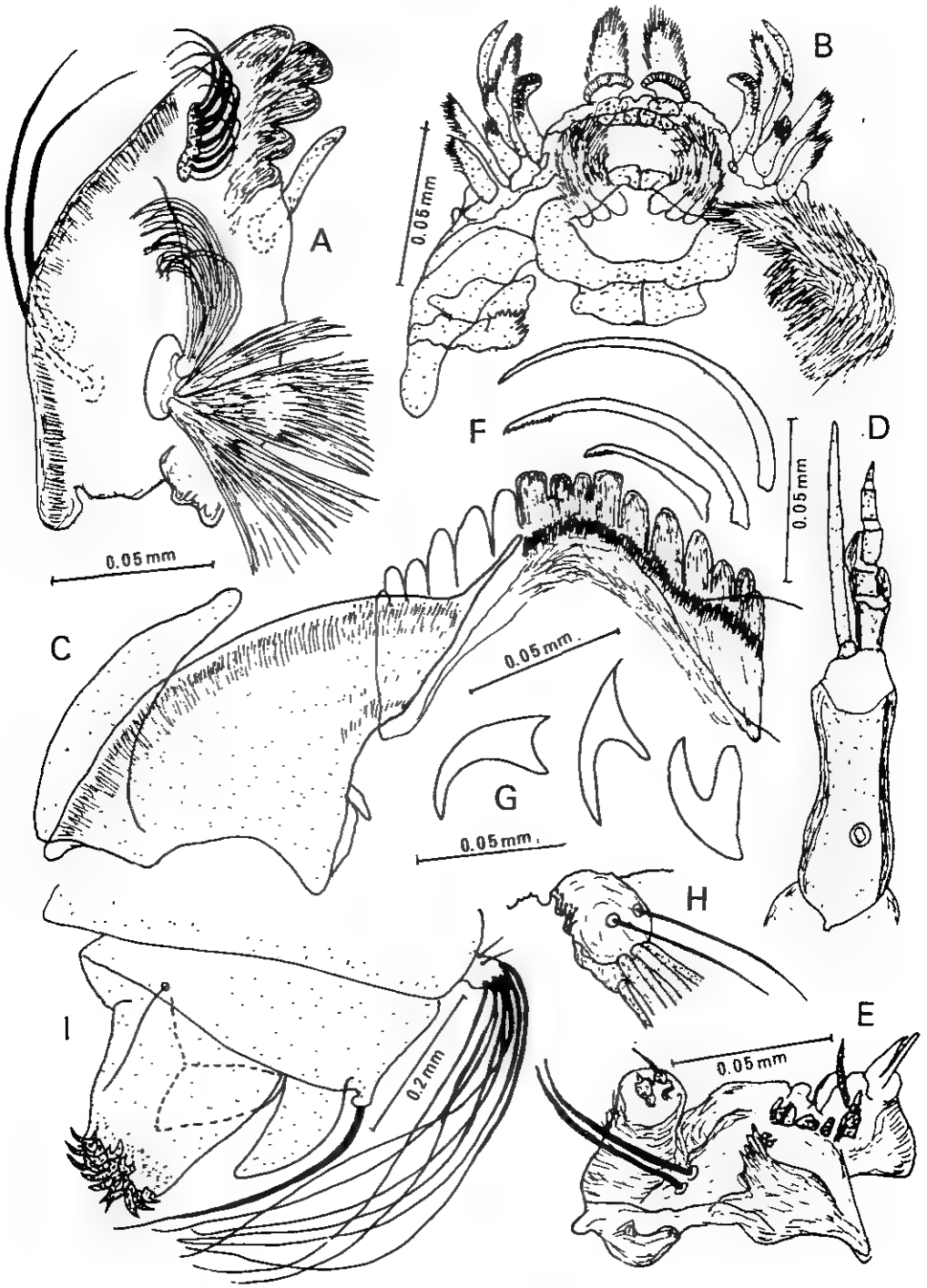

Fig. 37. ***Stictochironomns akizukii,*** **(Tokunaga).Larva.**

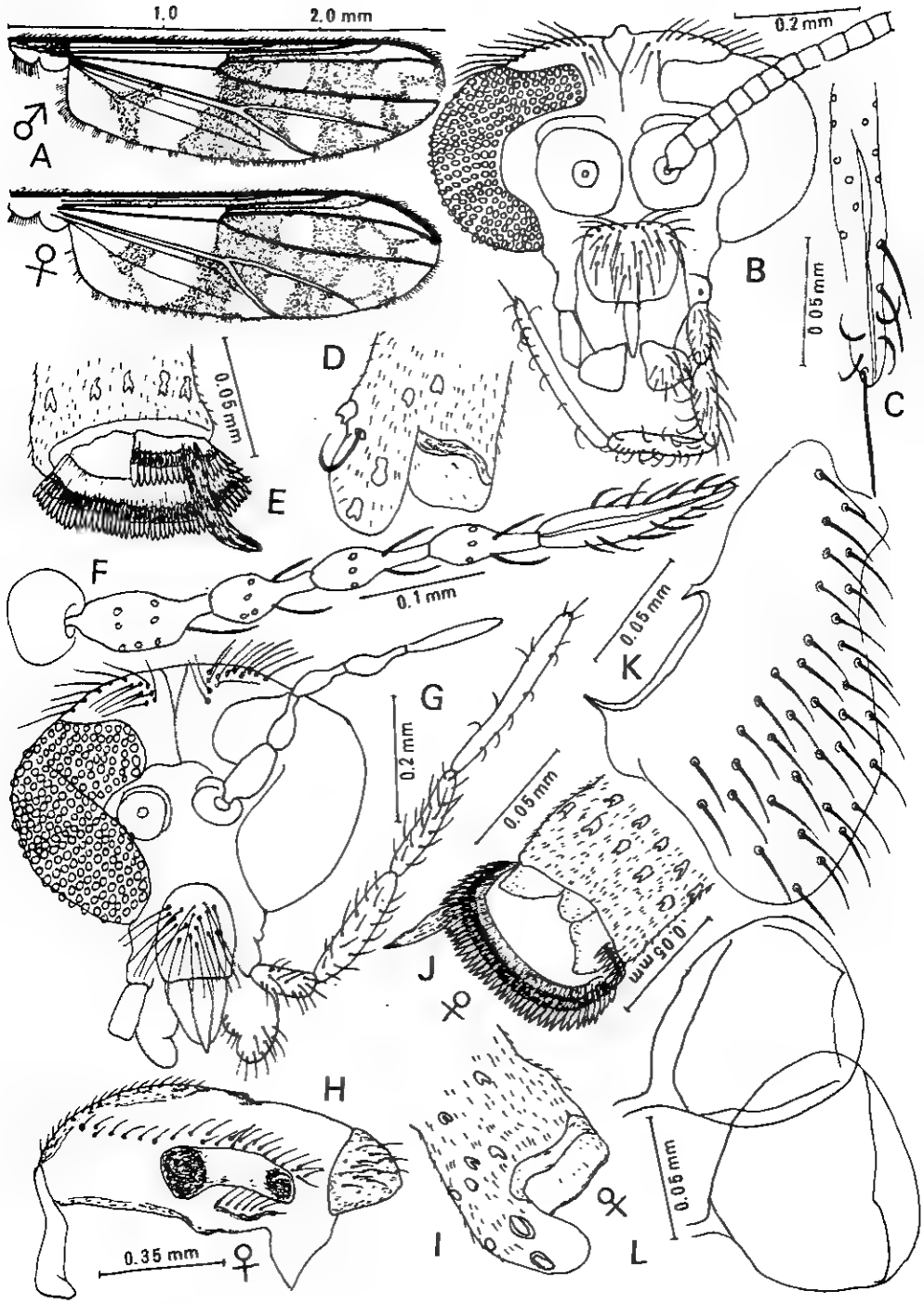

Fig. 38. *Stictochironomus multannulatus*, (Tokunaga). Adult.

Fig. 39. ***Stictochironomus multannulatus,*** **(Tokunaga). Male.**

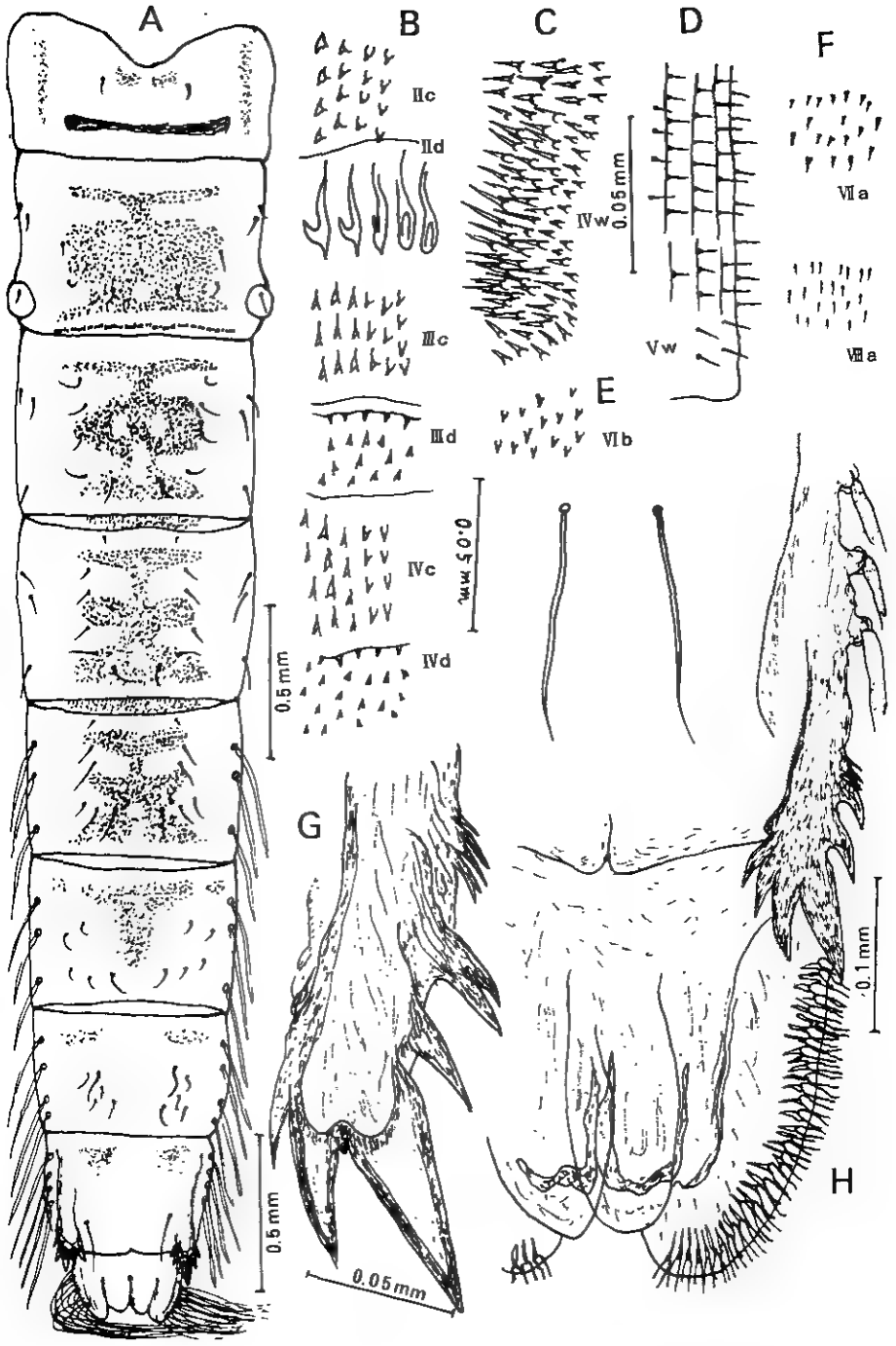

Fig. 40. *Stictochironomus multannulatus,* (Tokunaga). Pupa.

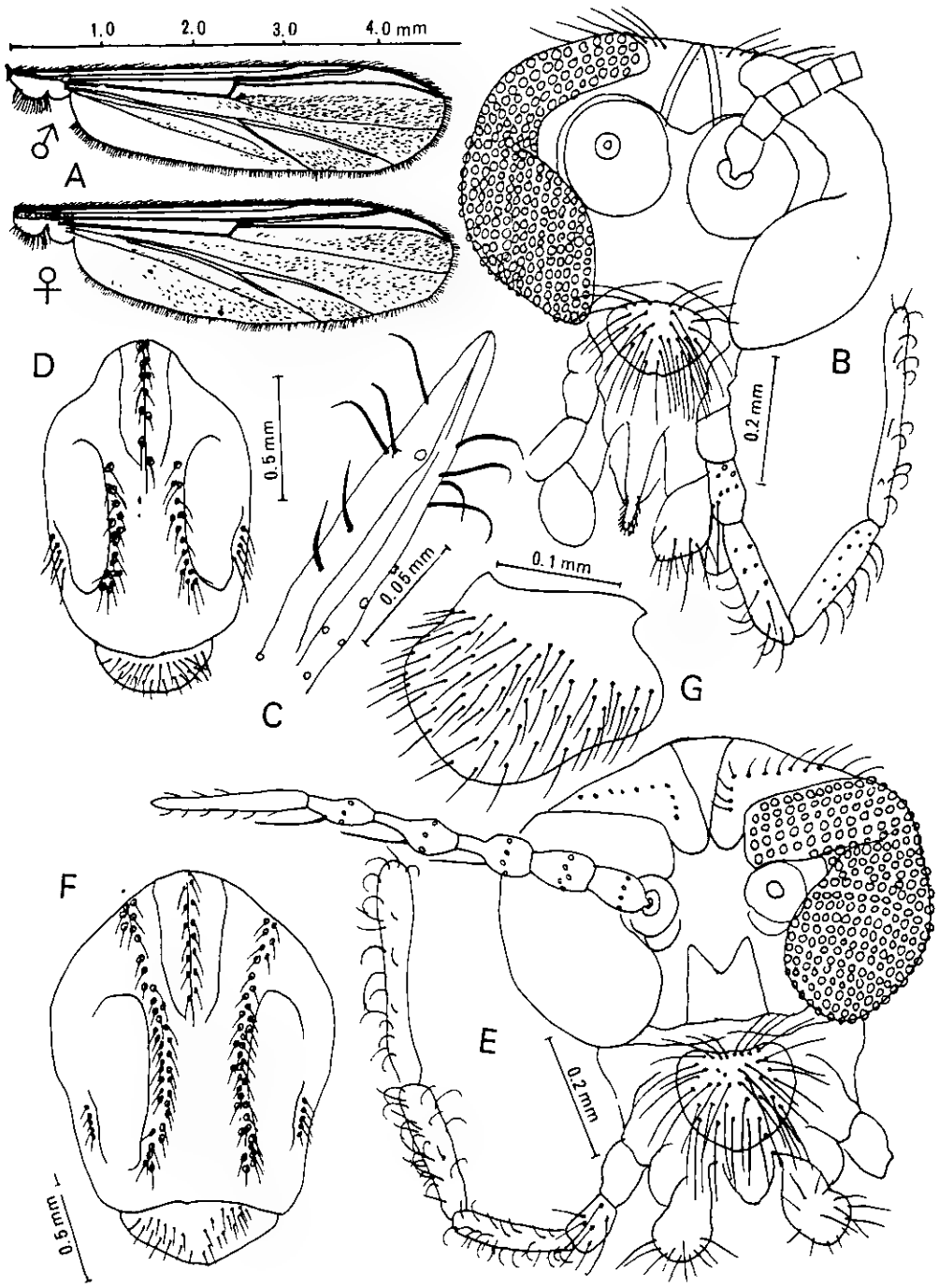

Fig. 41. ***Phaenopsectra kizakiensis,*** **(Tokunaga). Adult.**

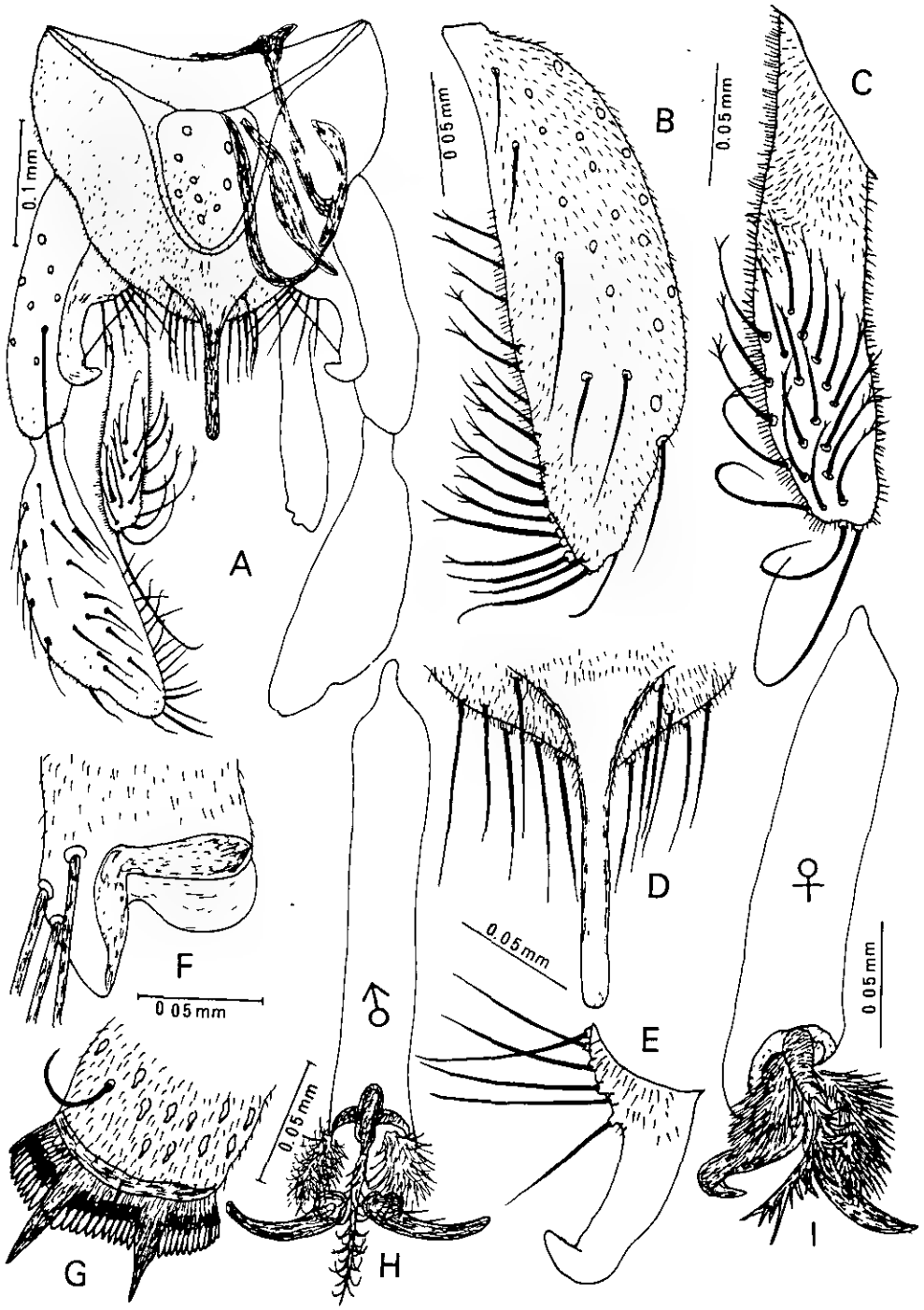

Fig. 42. ***Phaenopsectra kizakiensis,*** **(Tokunaga). Adult.**

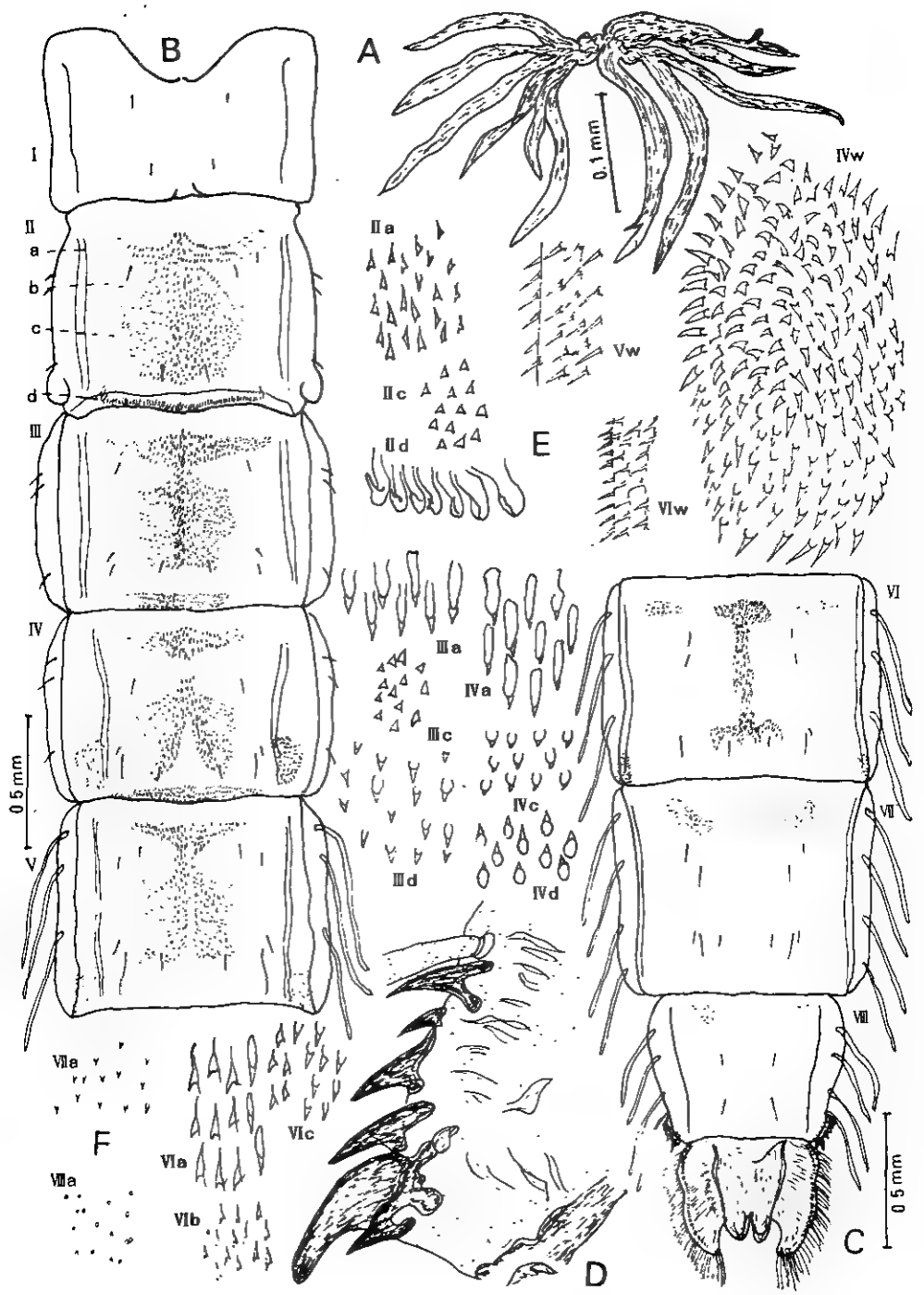

Fig. 43. ***Phaenopsectra kizakiensis,*** **(Tokunaga). Pupa.**

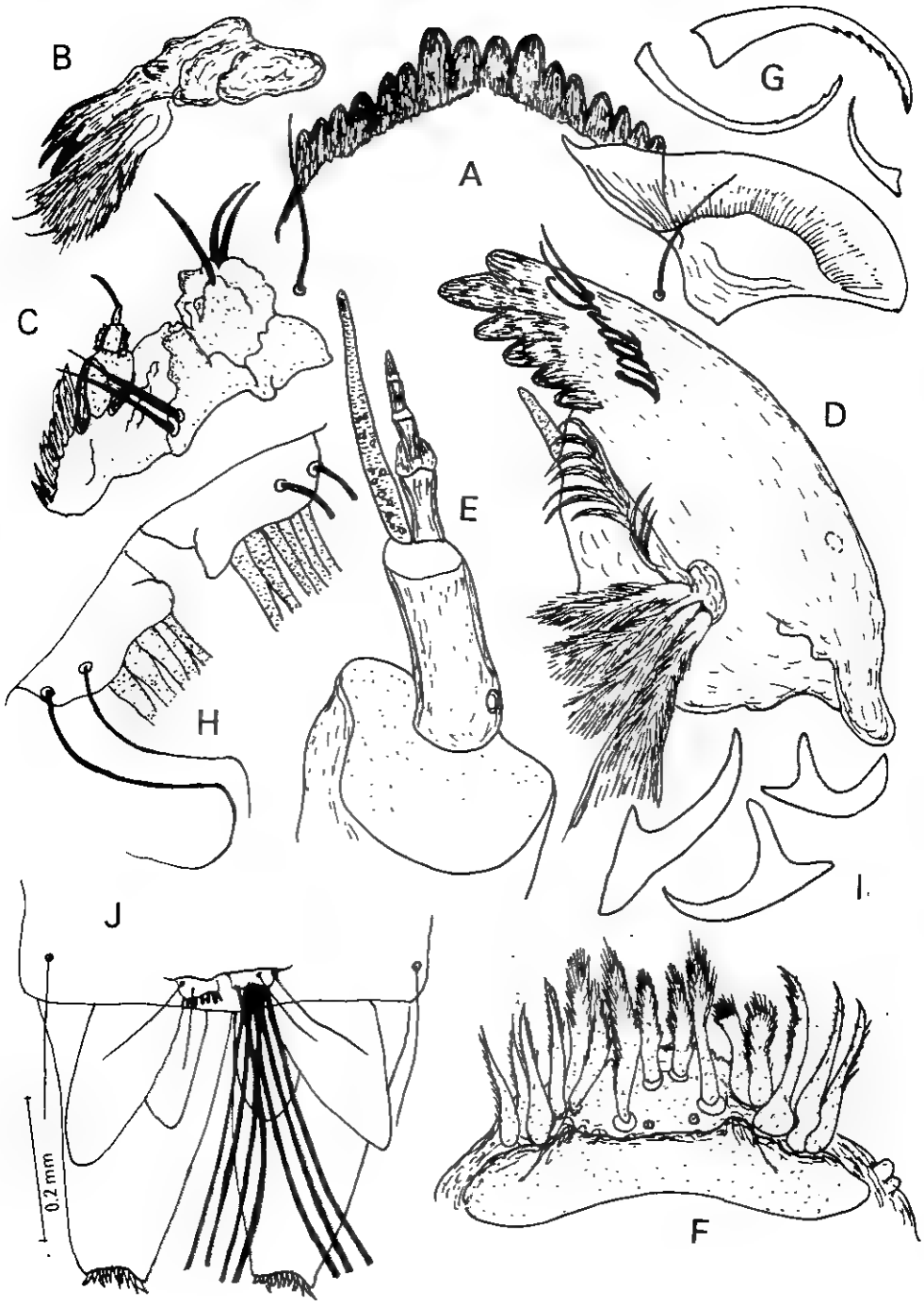

Fig. 44. ***Phaenopsectra kizakiensis,*** **(Tokunaga). Larva.**

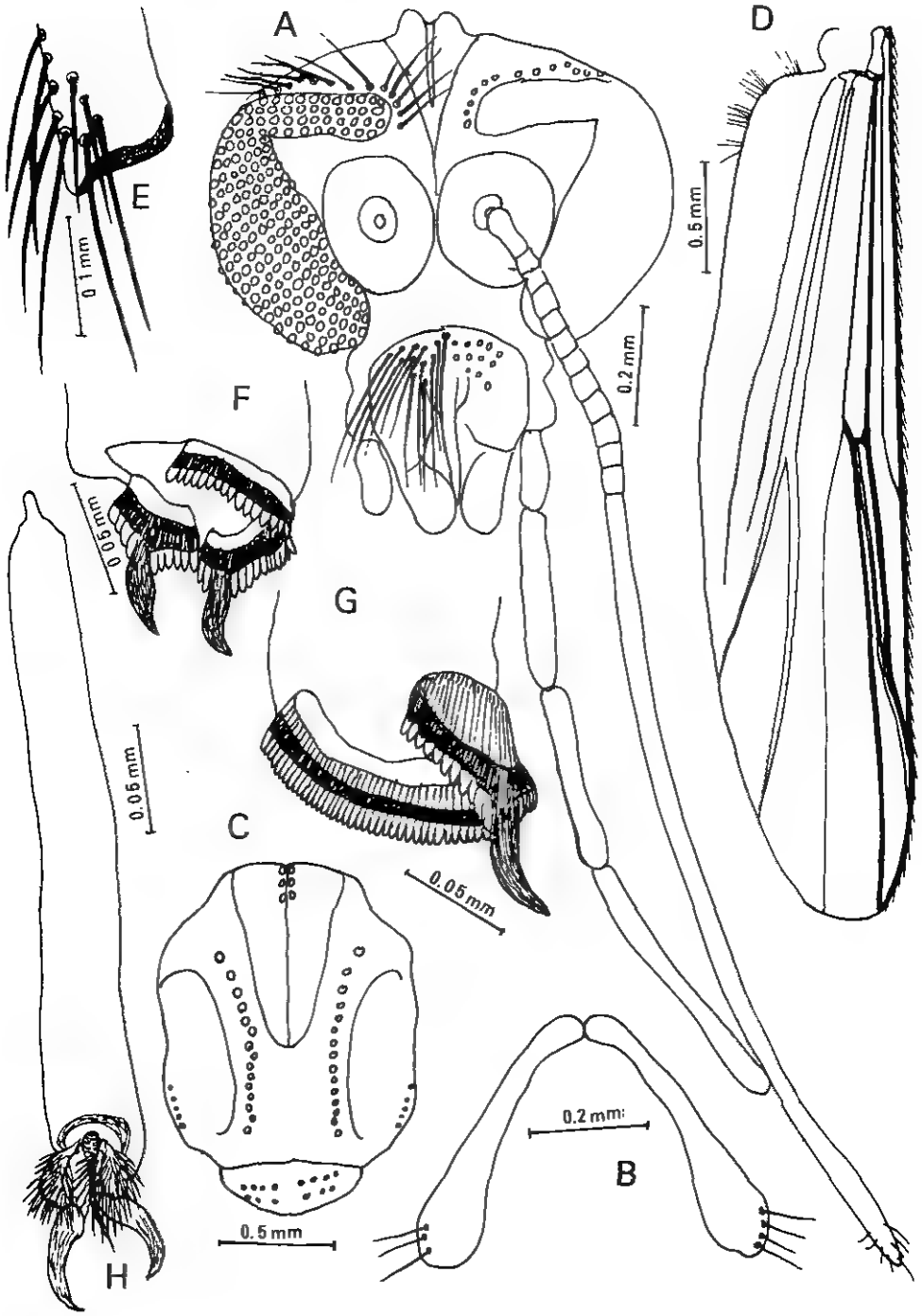

Fig. 45. ***Microtendipes chloris,*** **(Meigen). Male.**

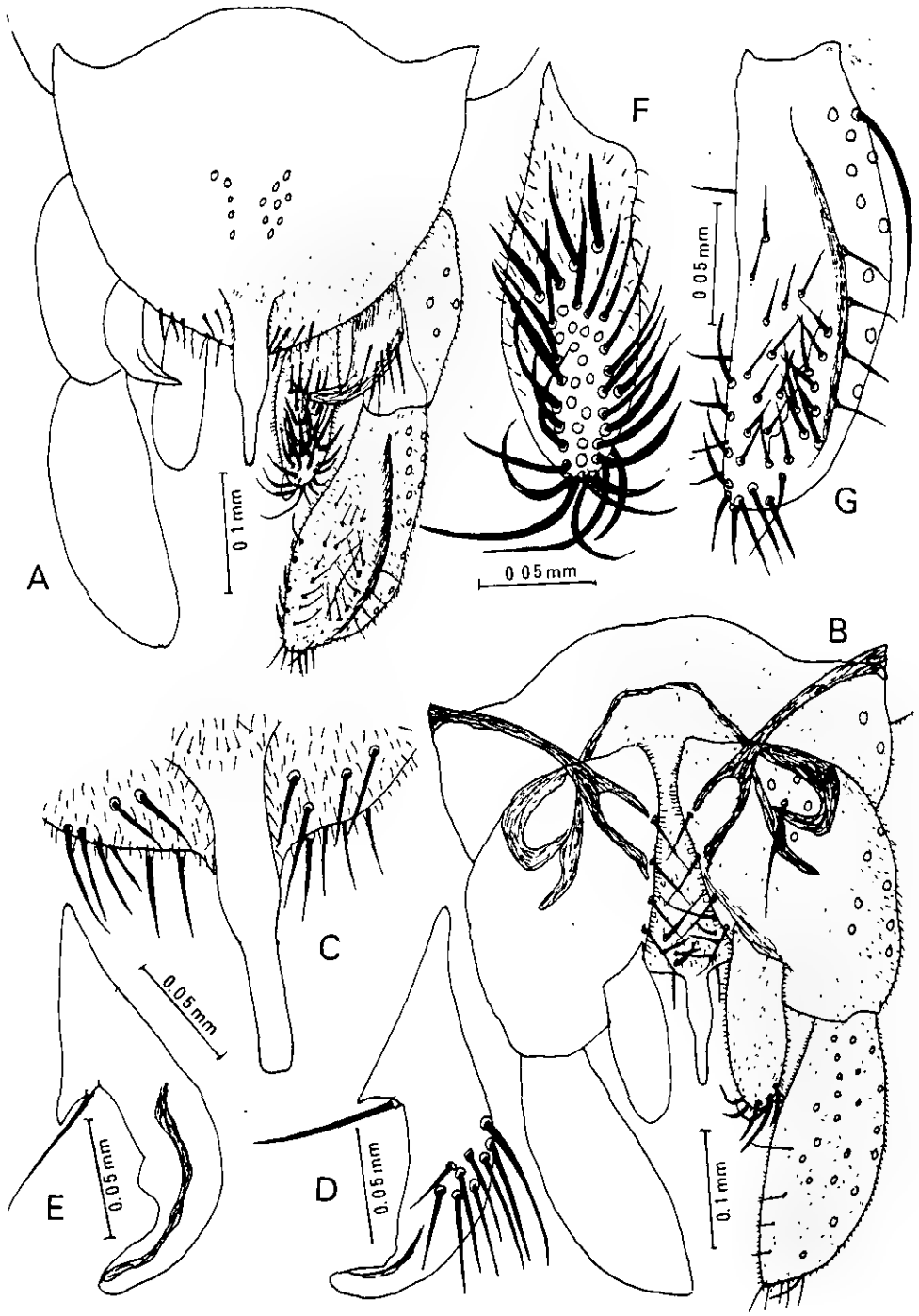

Fig. 46. ***Microtendipes chloris,*** **(Meigen). Male.**

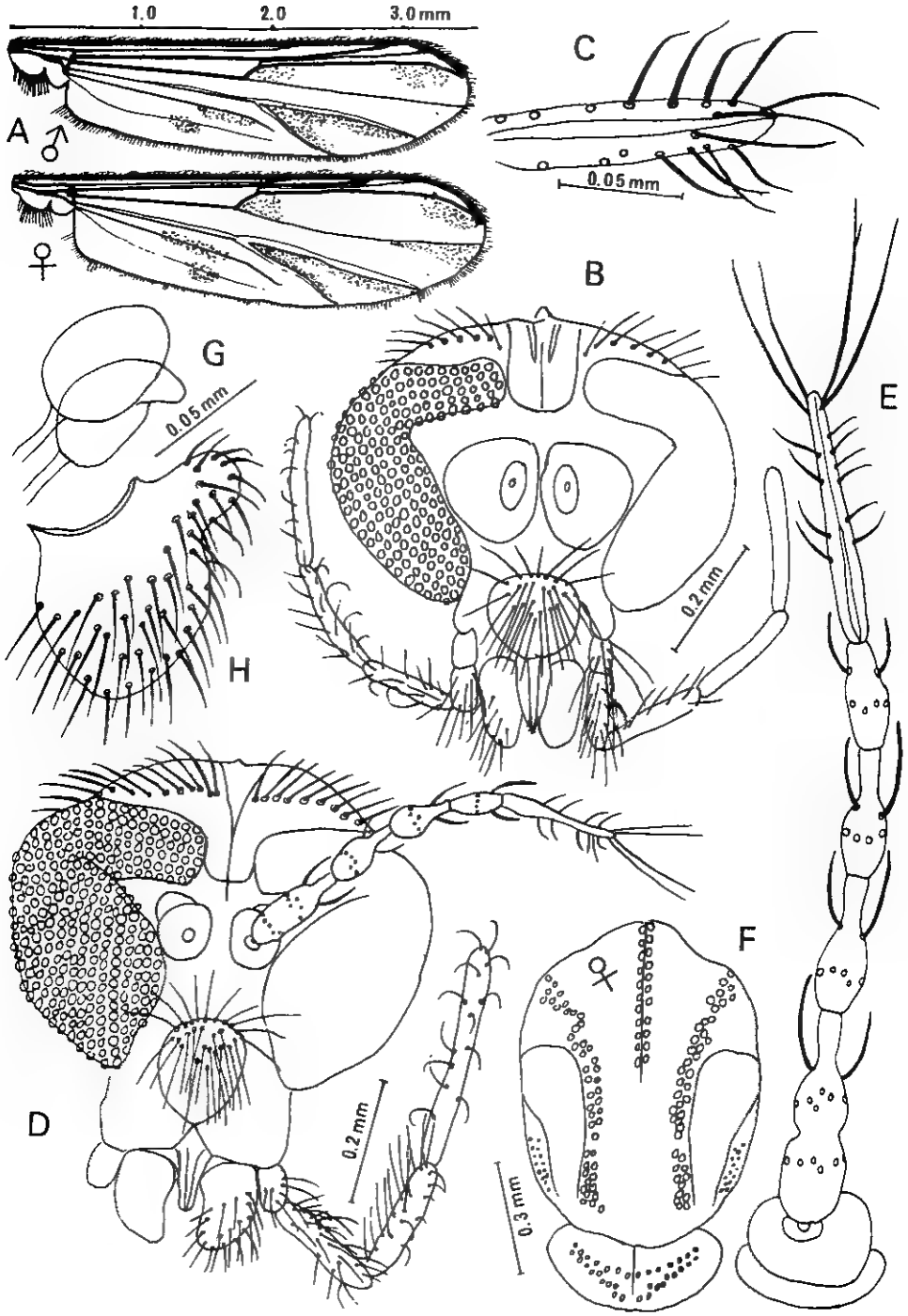

Fig. 47. ***Polypedilum nubeculosum,*** **(Meigen). Adult.**

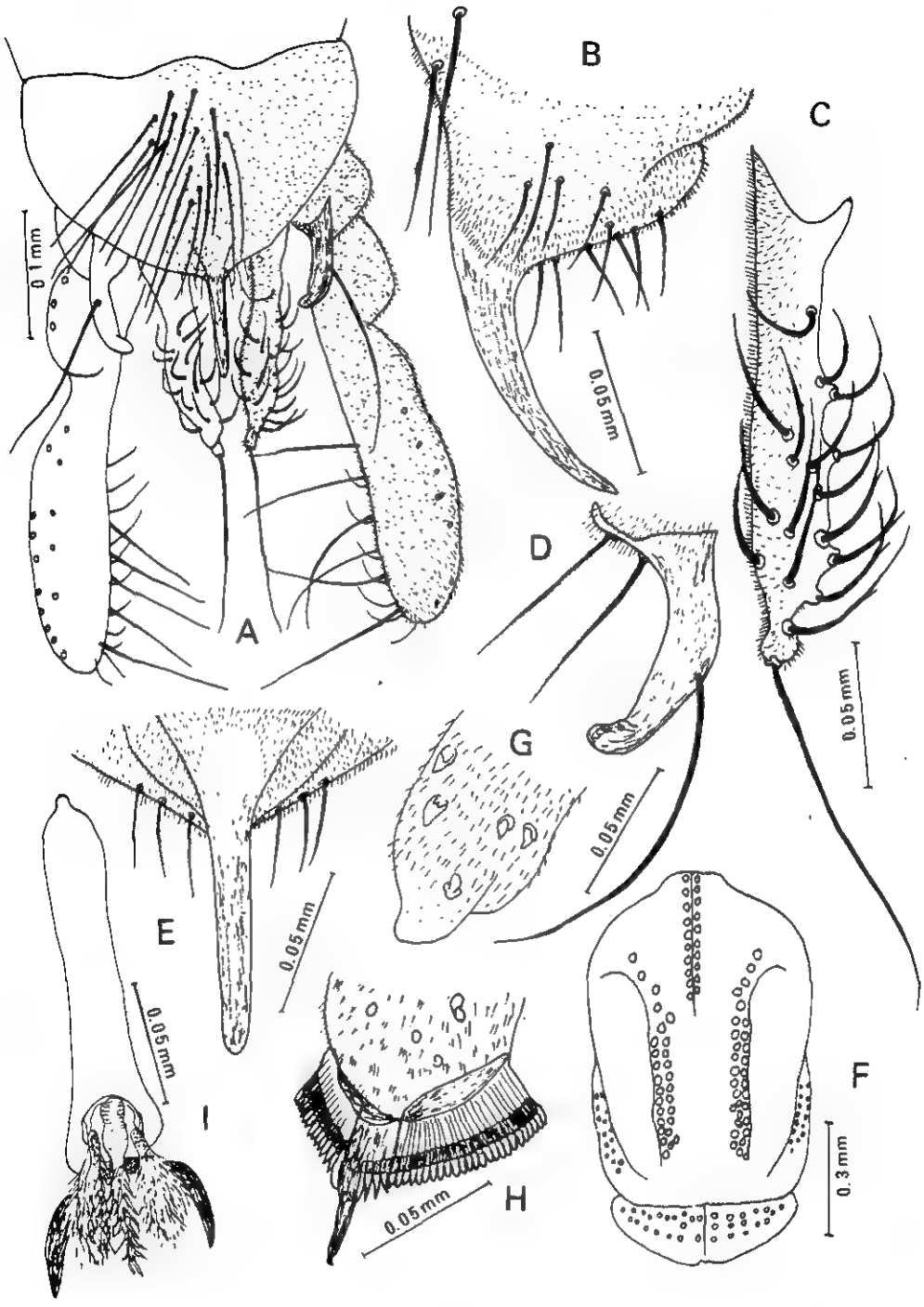

Fig. 48. ***Polyedilum nubeculosum,*** **(Meigen). Male.**

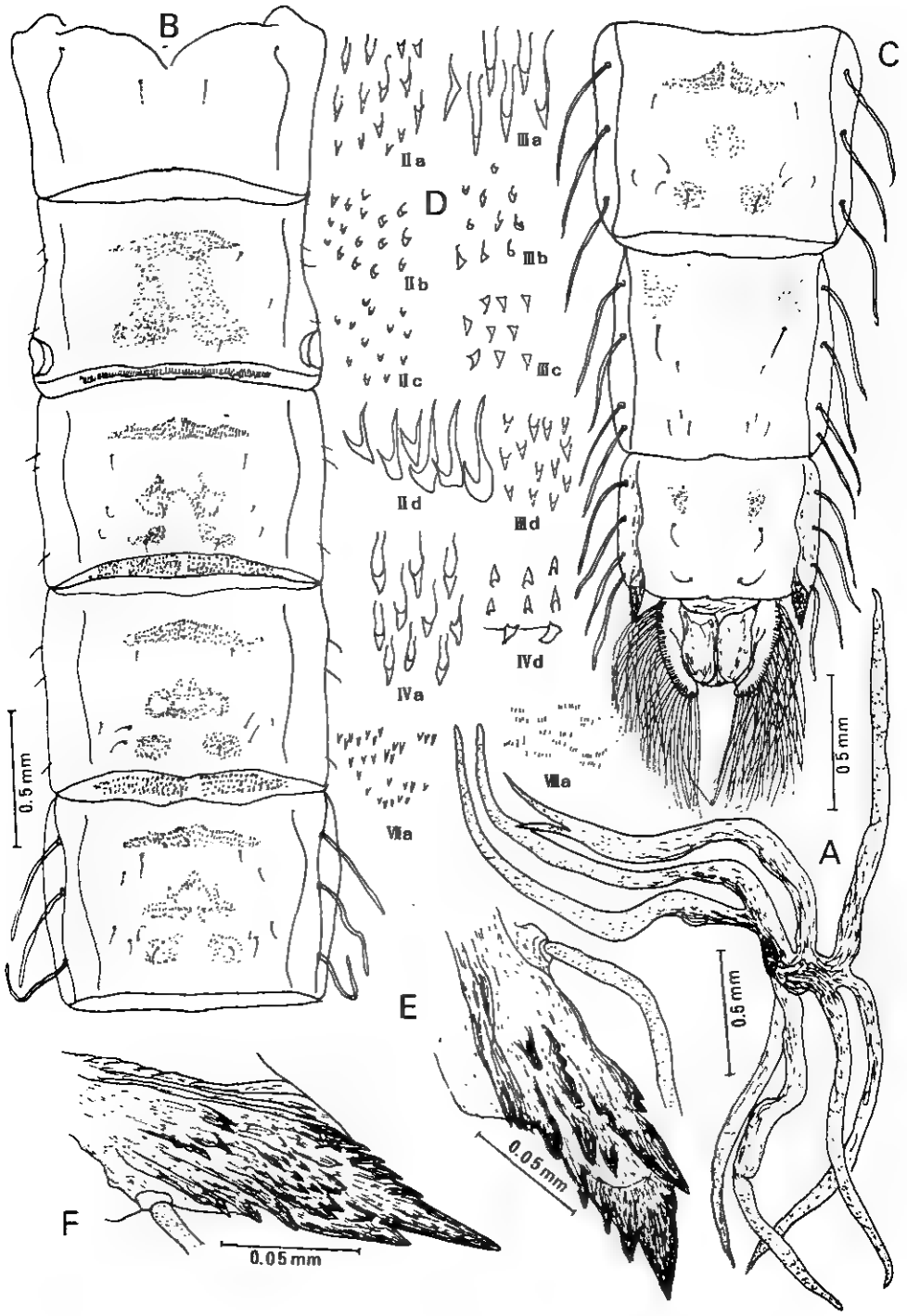

Fig. 49. ***Polypedilum nubecalosum,*** **(Meigen). Pupa.**

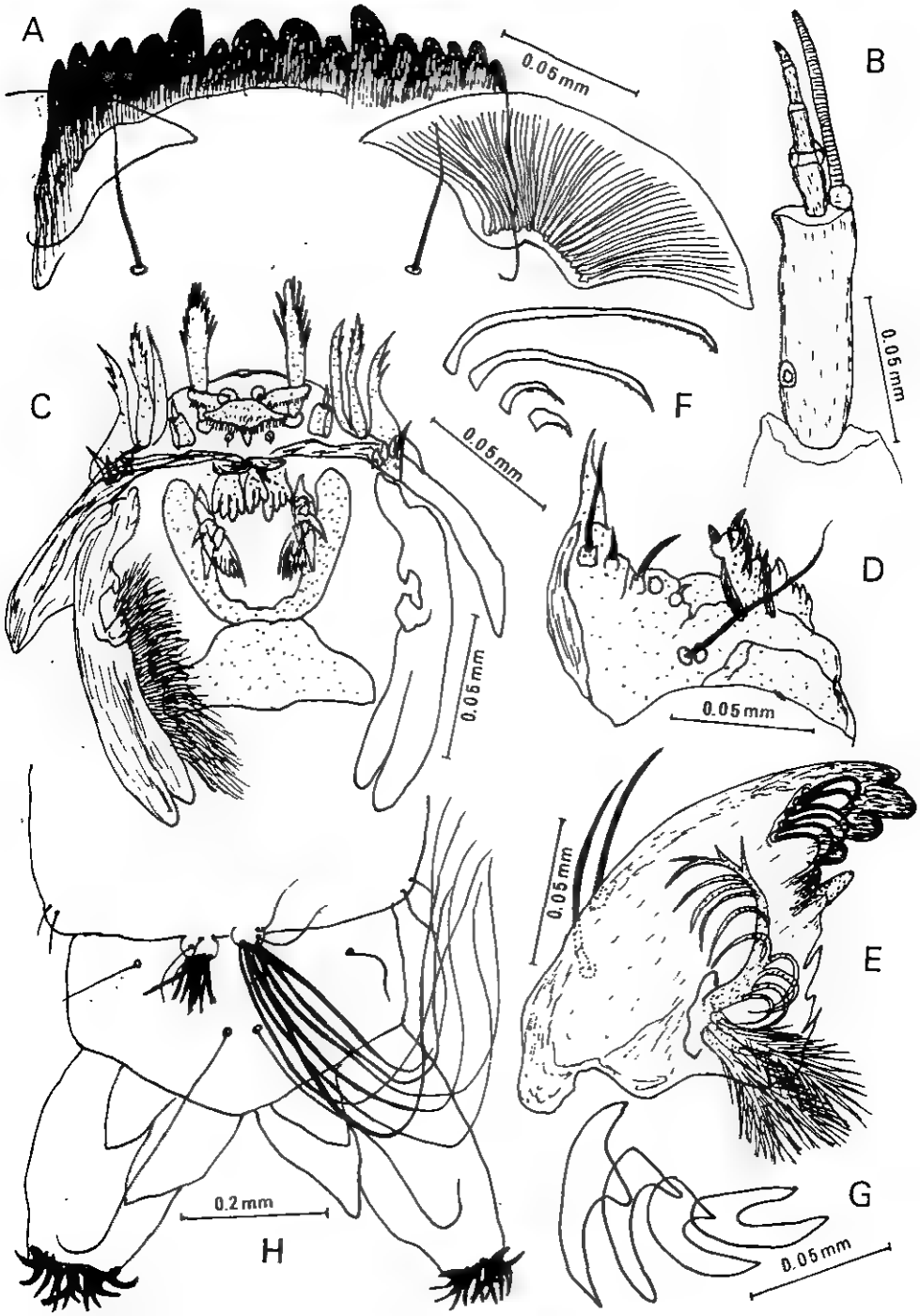

Fig. 50. ***Polypedilum nubeculosum,*** **(Meigen). Larva.**

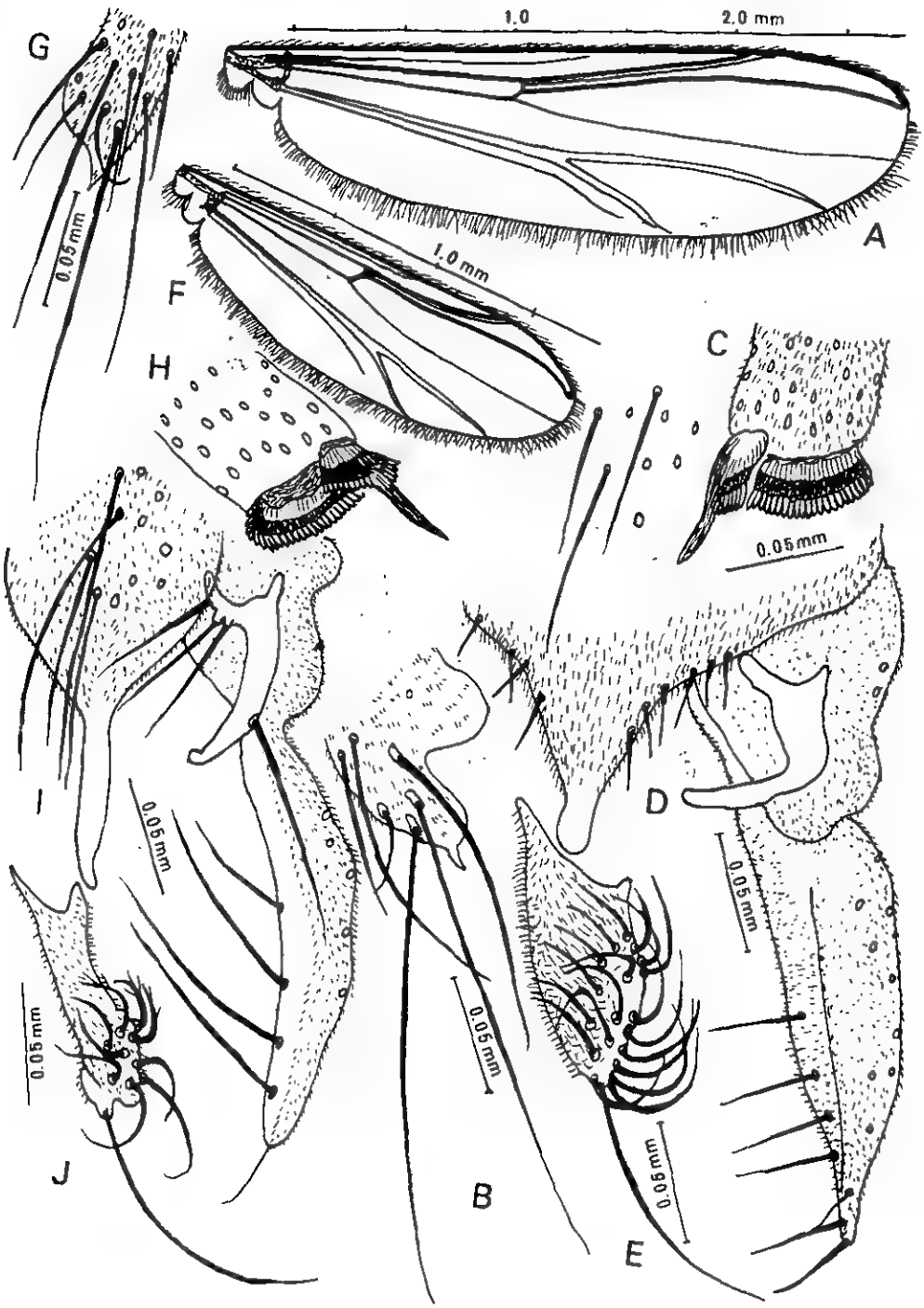

Fig. 51. ***Polypedilum asakawaense,*** **Sasa. Male (A-E)**
Polypedilum tamanijrum, **Sasa. Male (F-J)**

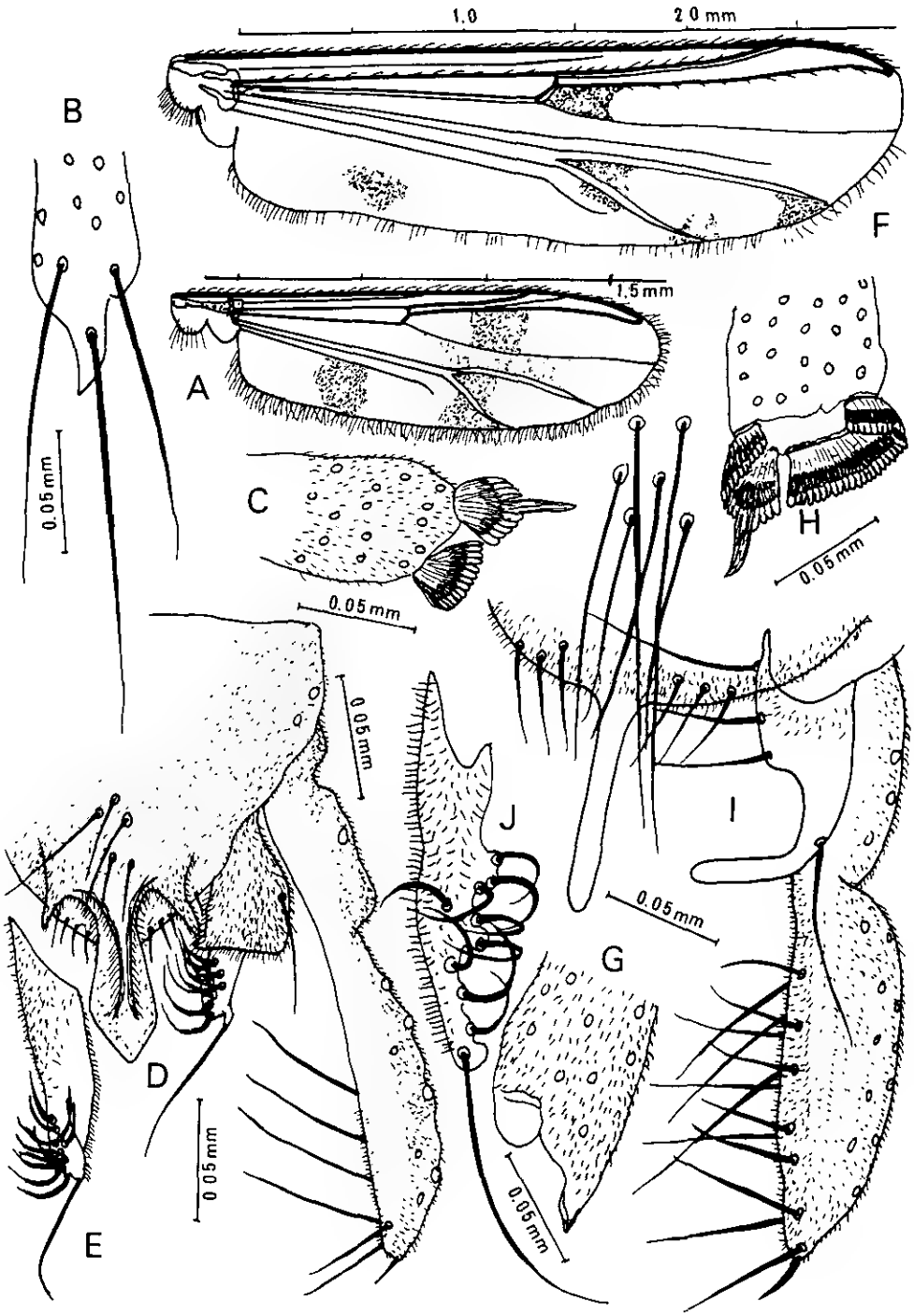

Fig. 52. *Polypedilum* sp. "chuzetripodrum", Male (A-E)
Polypedilum tamagohanum, Sasa. Male (G-J)

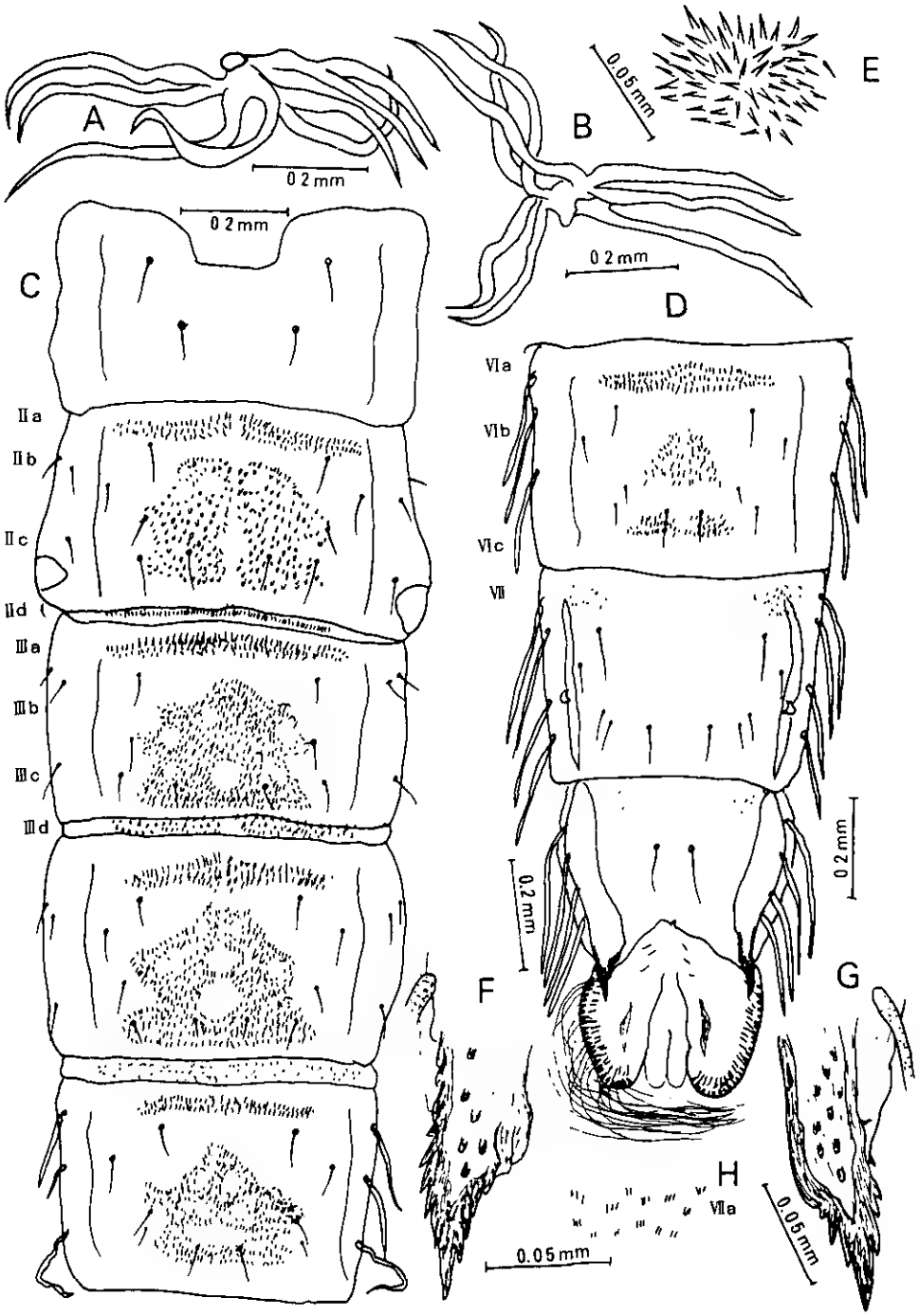

Fig. 53. ***Polypedilum tamagohanum*, Sasa. Papa.**

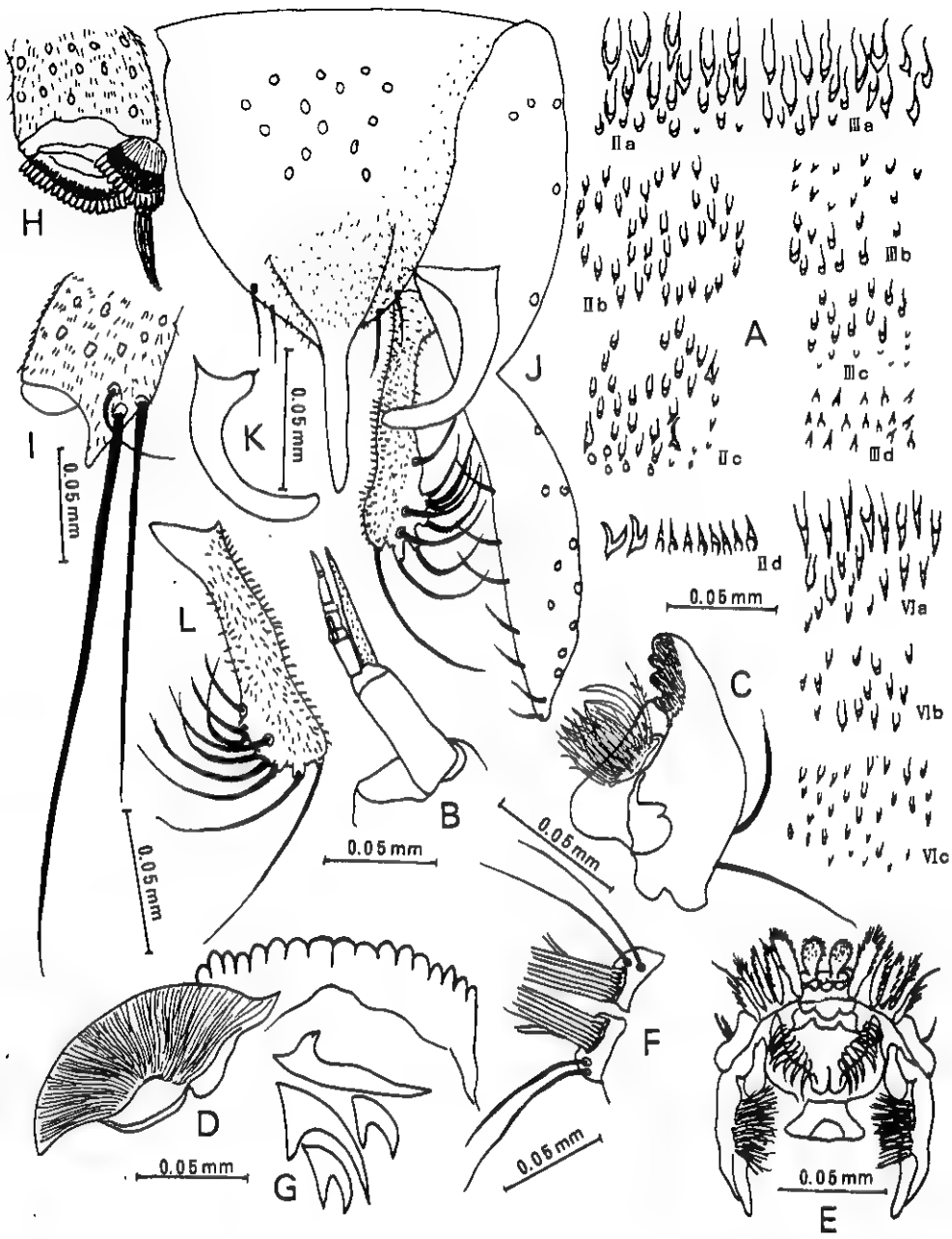

Fig. 54. ***Polypedilum tamagohanum,*** **Sasa. Papa&Larva (A-G)**
Polypedilum **sp. "chuzenudum", Male (H-L)**

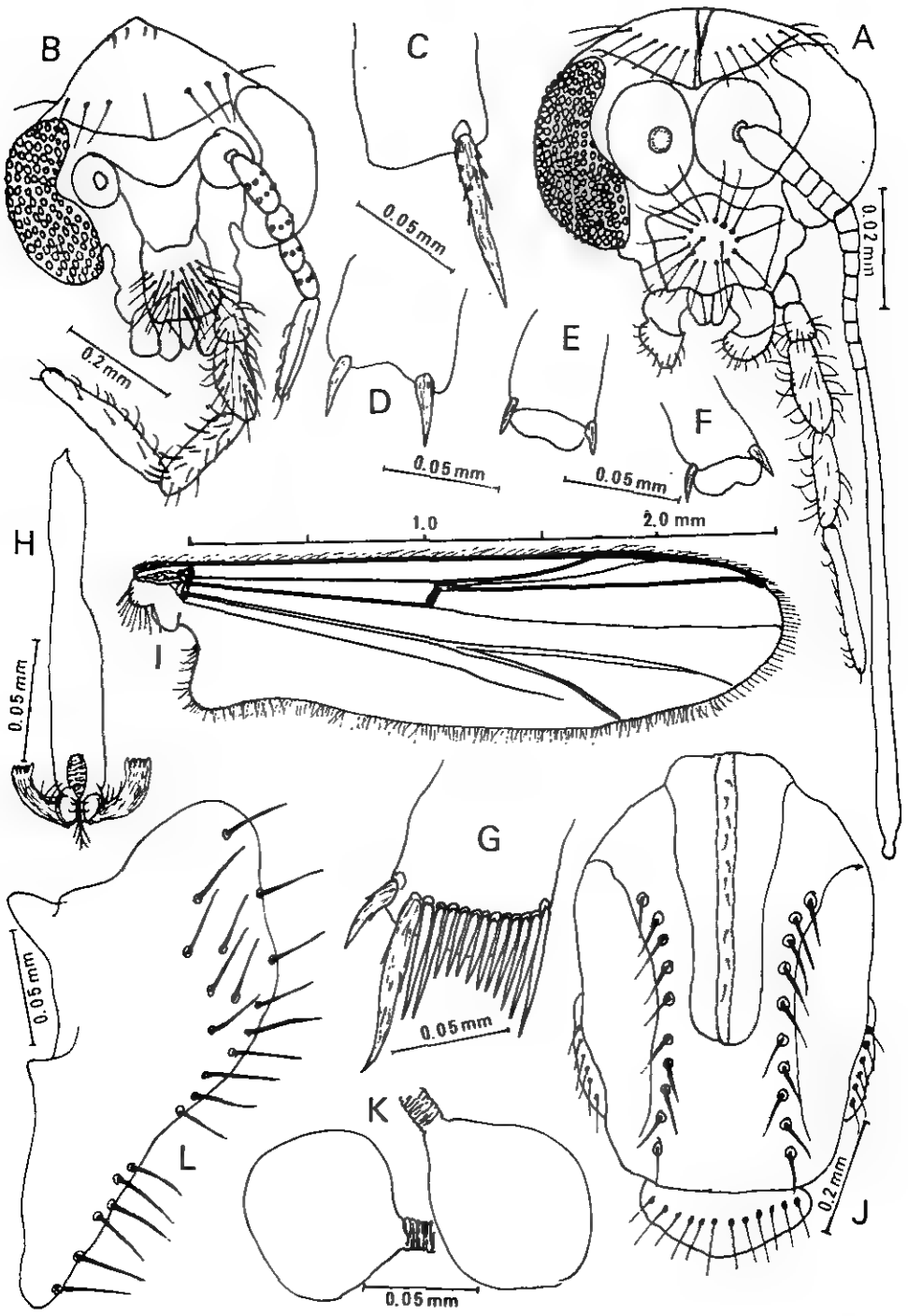

Fig. 55. ***Orthocladius chuzesextus,*** **sp. nov. Adult.**

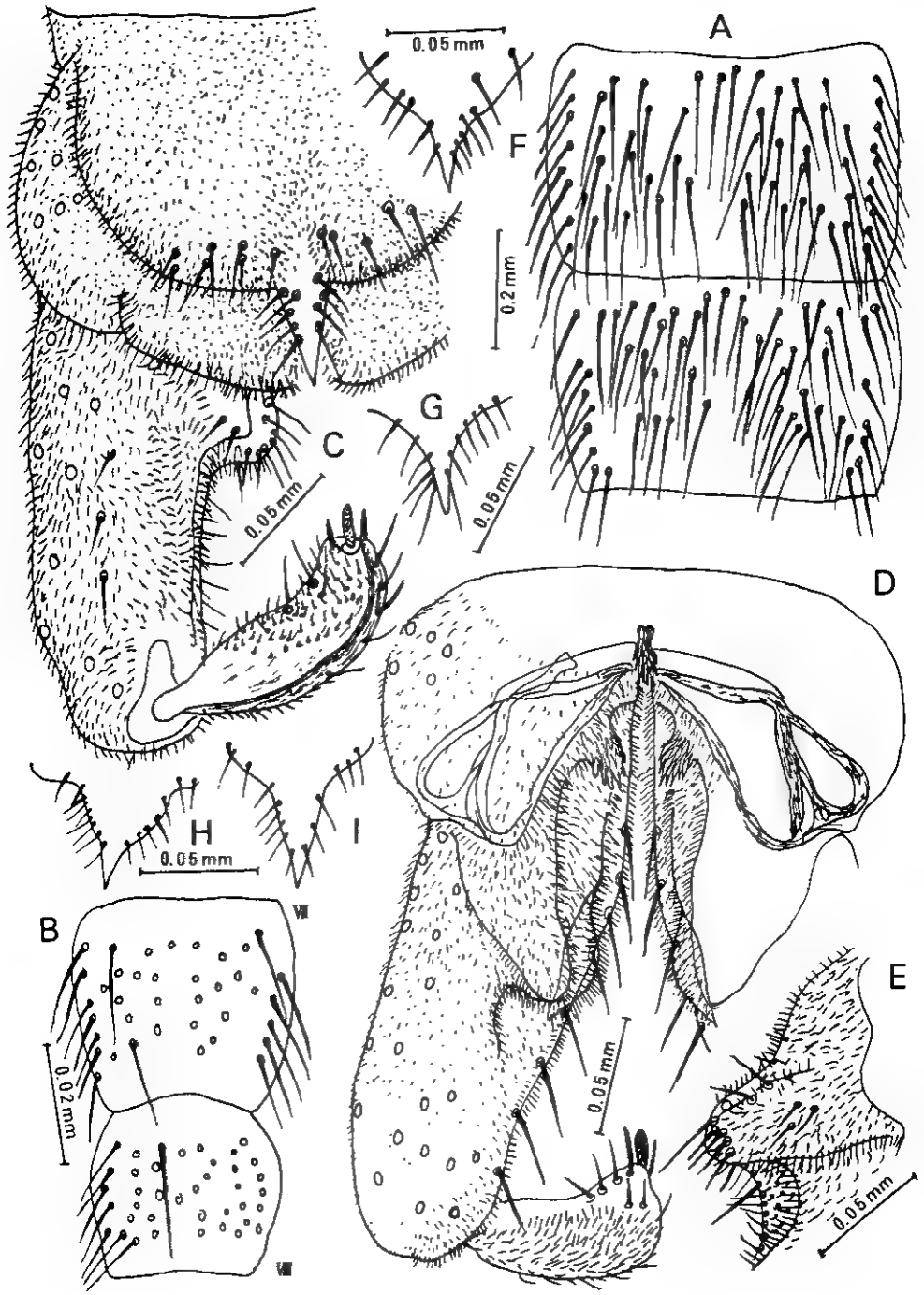

Fig. 56. ***Orthocladius chuzesextus,*** **sp. nov. Male.**

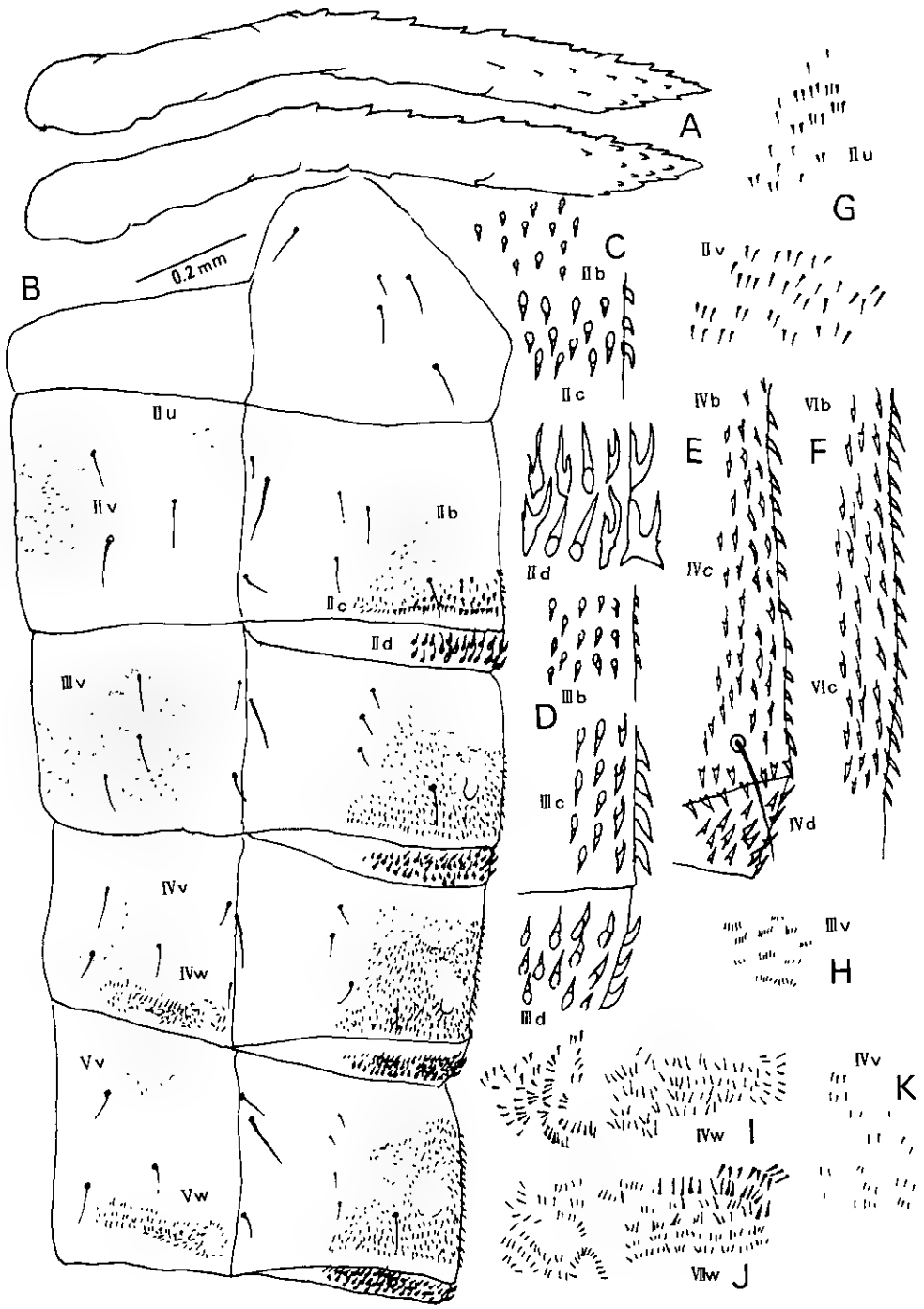

Fig. 57. ***Orthocladius chuzesextus*, sp. nov. Pupa.**

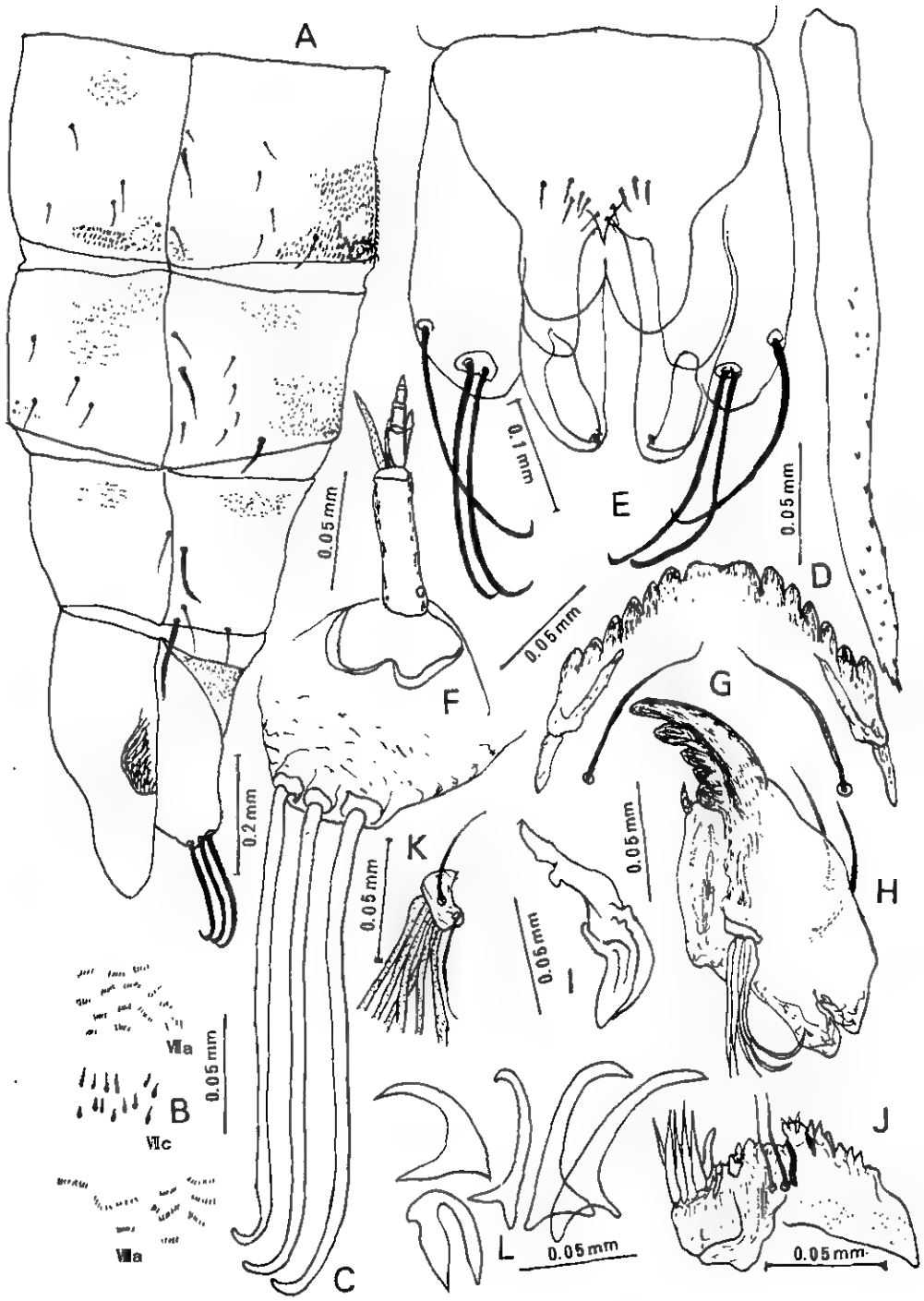

Fig. 58. ***Orthocladius chuzesextus,*** **sp. nov.**

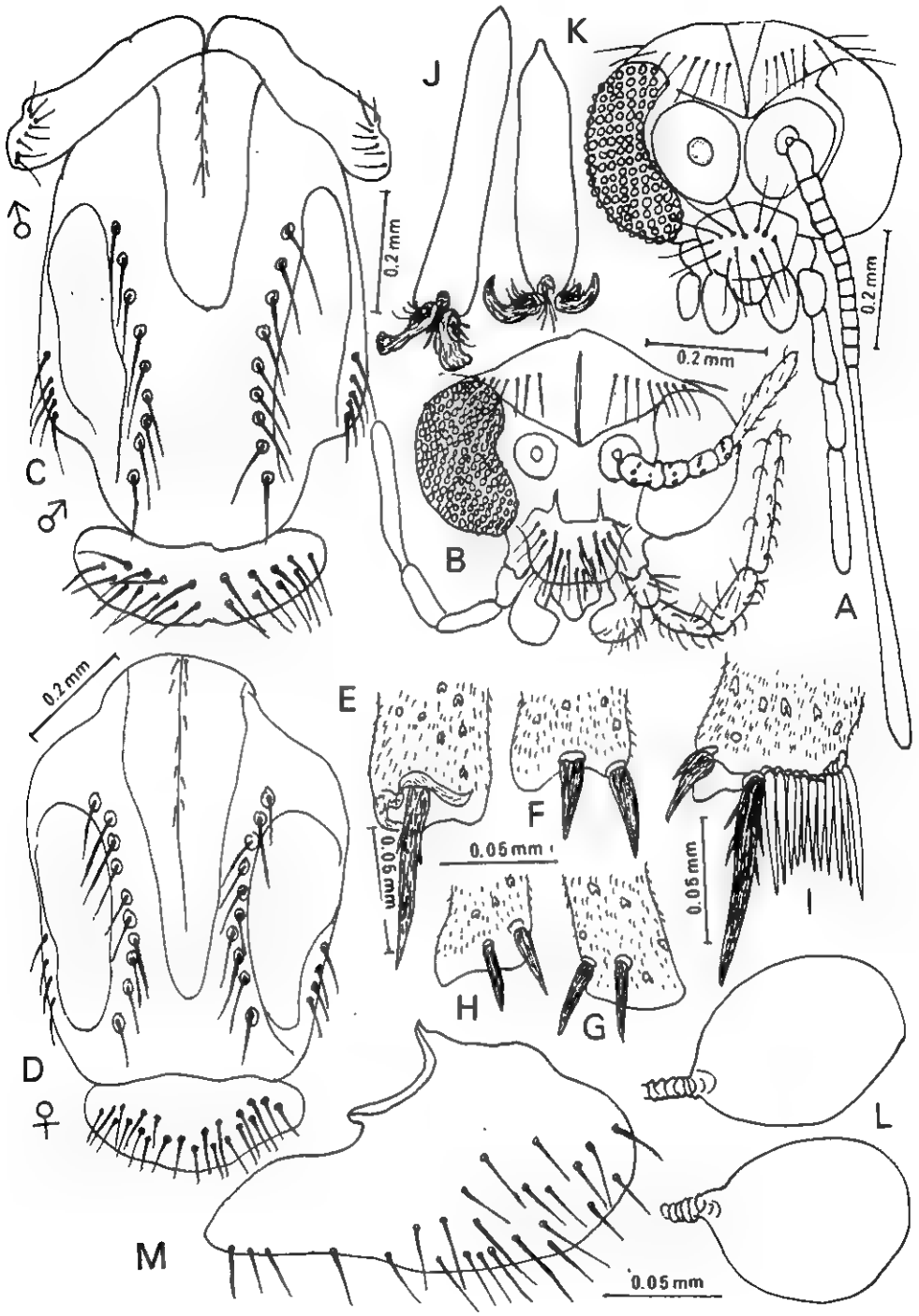

Fig. 59. ***Orthocladius (E.) chuzeseptimus,*** **sp. nov. Adult.**

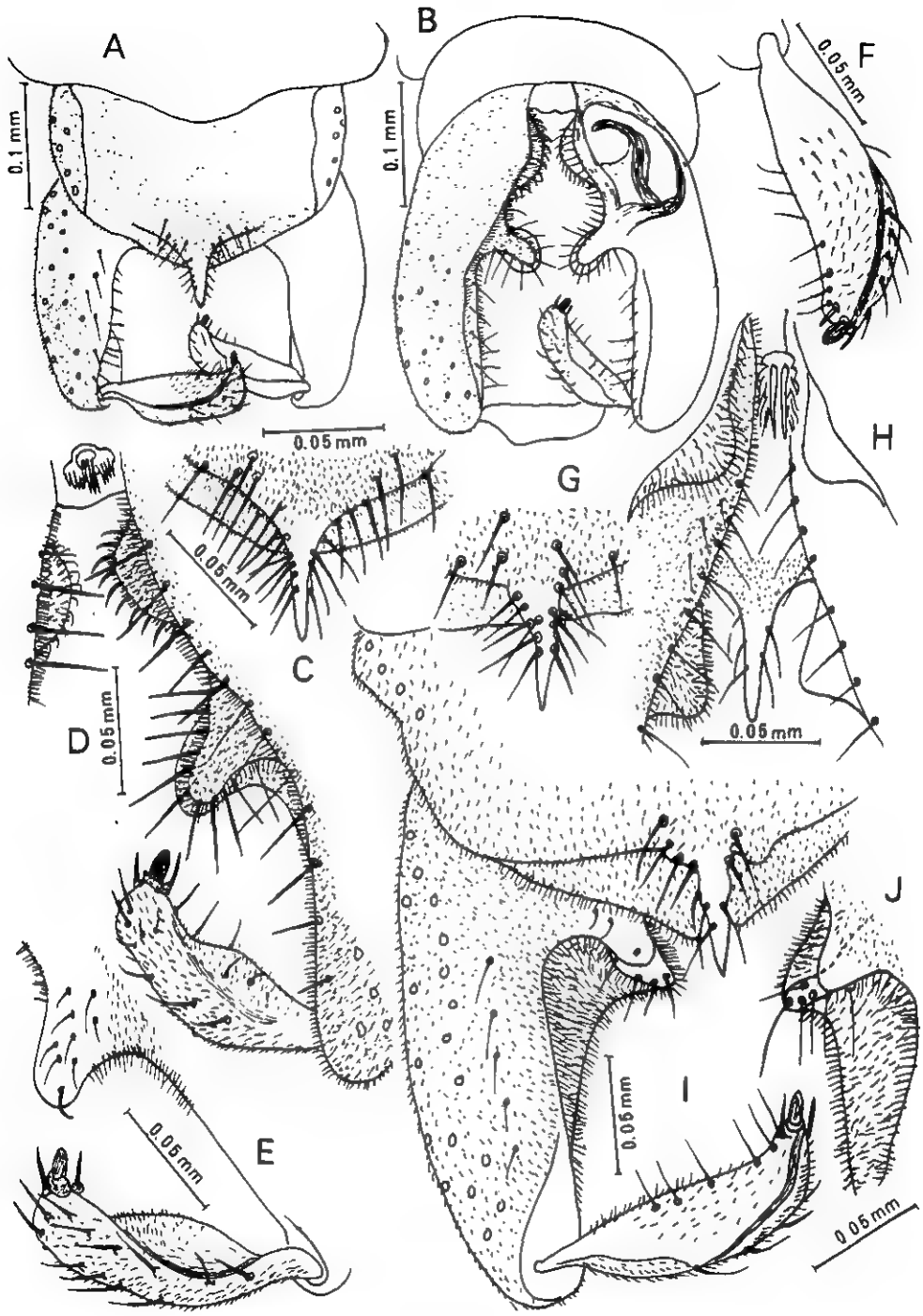

Fig. 60. ***Orthocladius (E.) chuzeseptimus,*** **sp. nov. Male.**

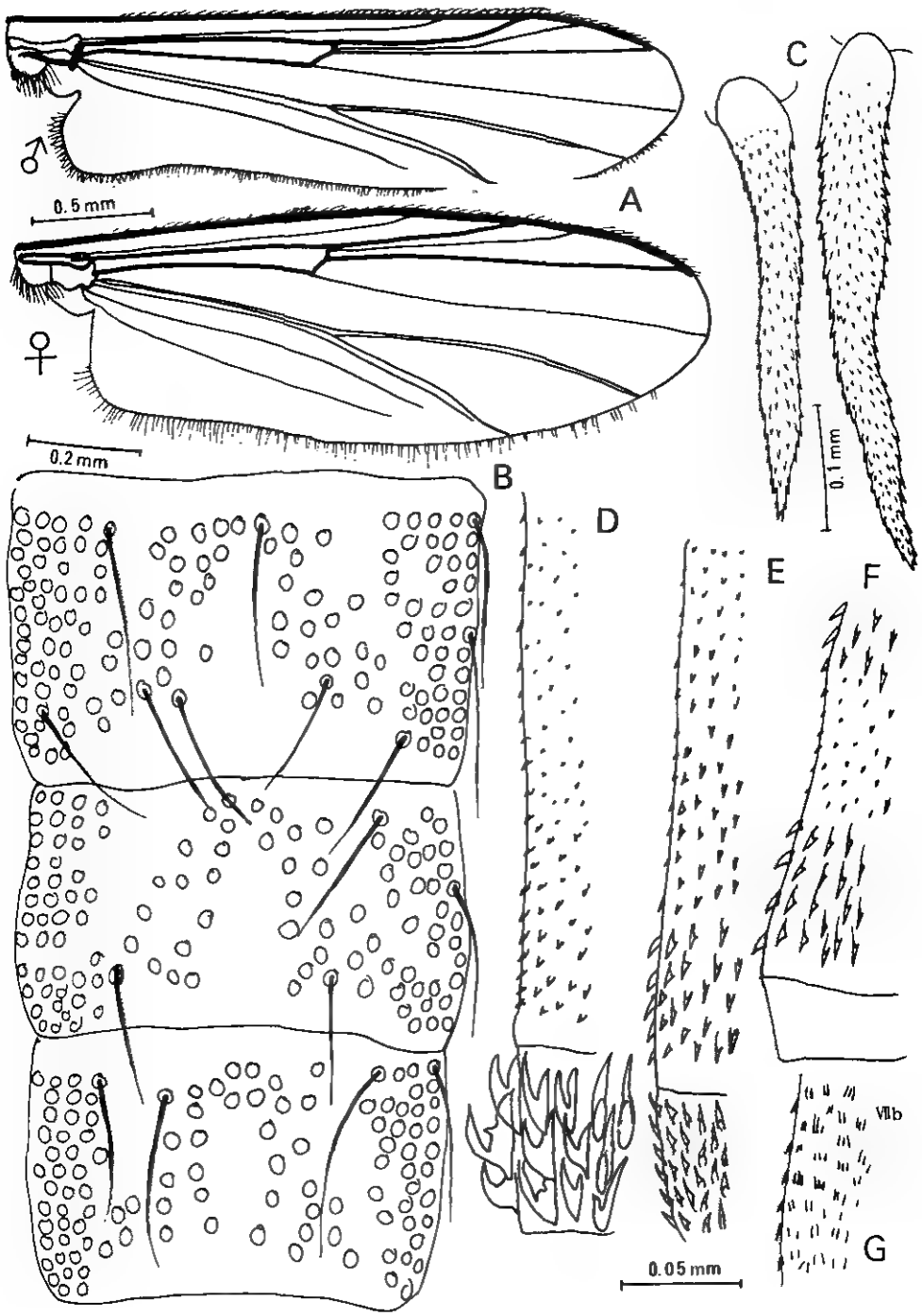

Fig. 61. ***Orthocladius (E.) chuzeseptimus,*** **sp. nov.**

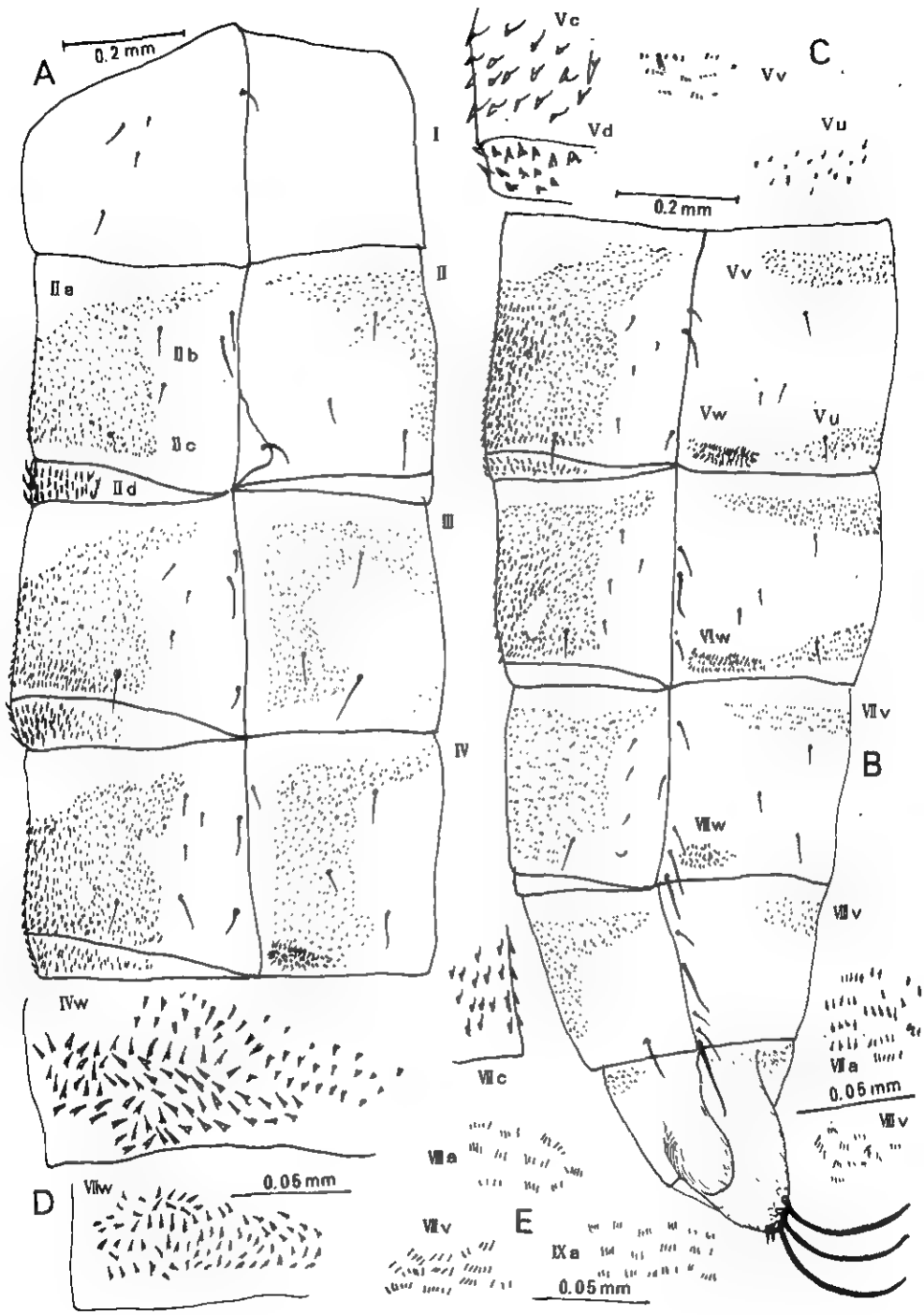

Fig. 62. ***Orthocladius (E.) chuzeseptimus,*** **sp. nov. Pupa.**

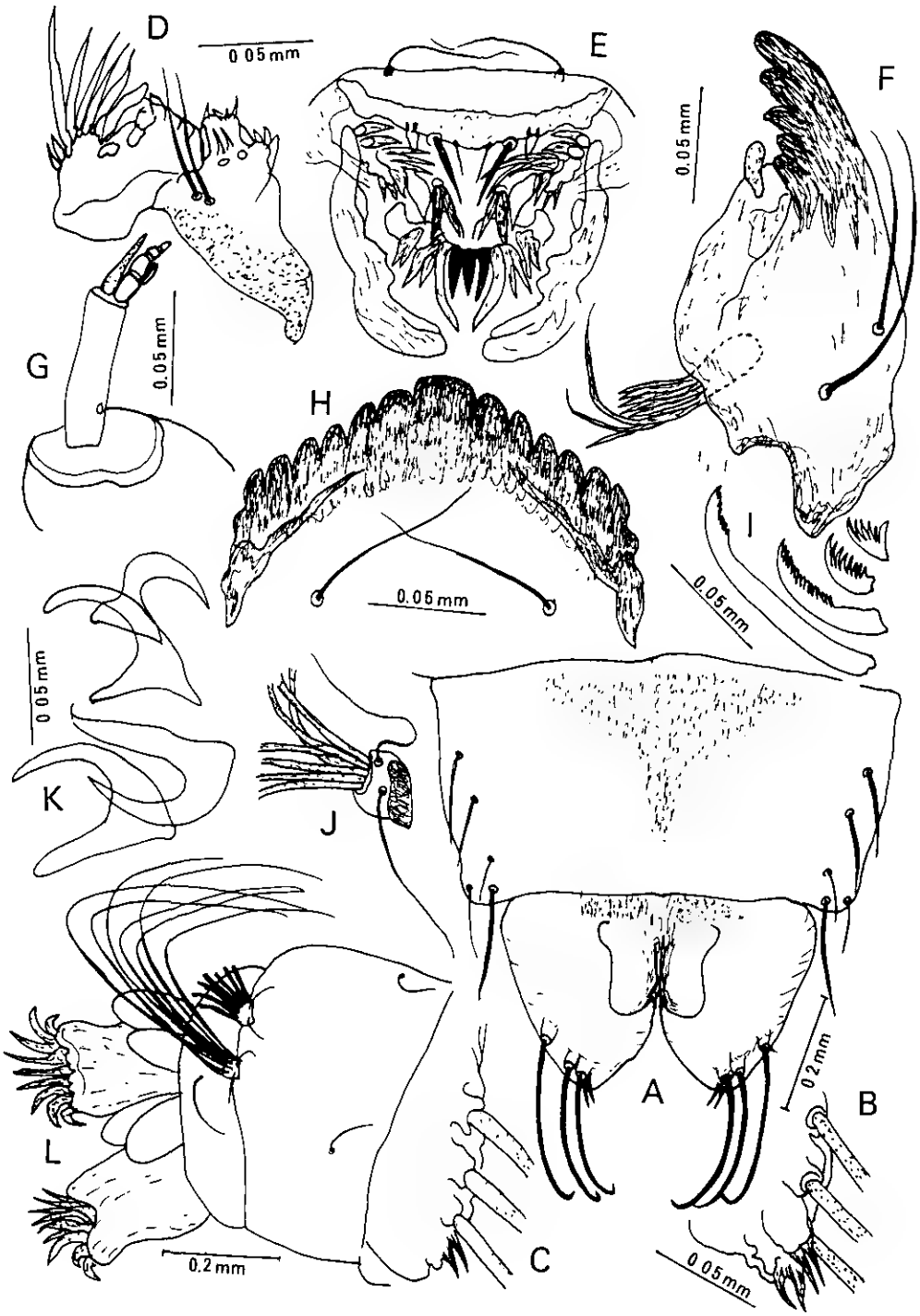

Fig. 63. ***Orthocladius (E.) chuzeseptimus,*** **sp. nov.**
Pupa (A-C), Larva (D-L).

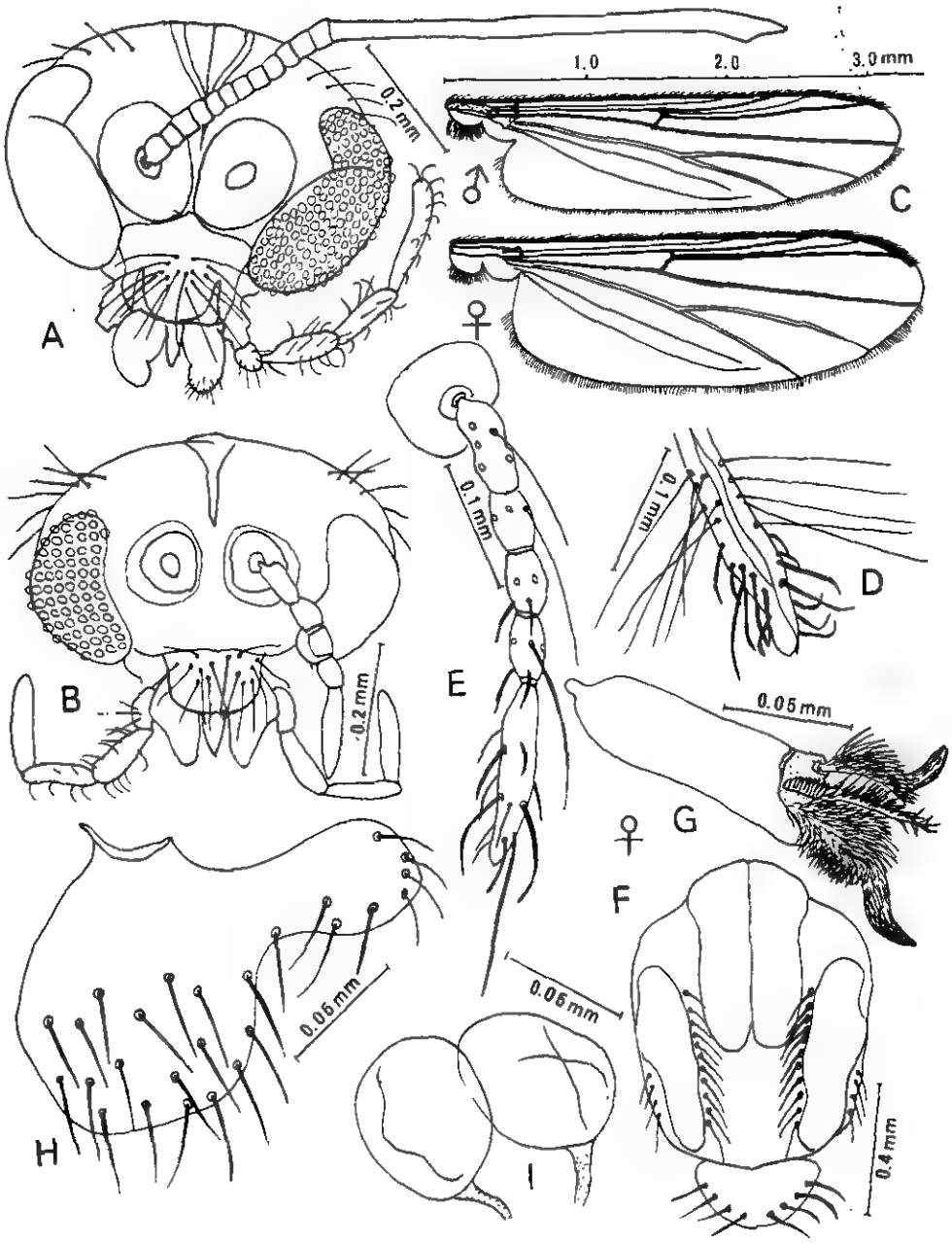

Fig. 64. ***Psectrocladius yunoquartus*, sp. nov. Adult.**

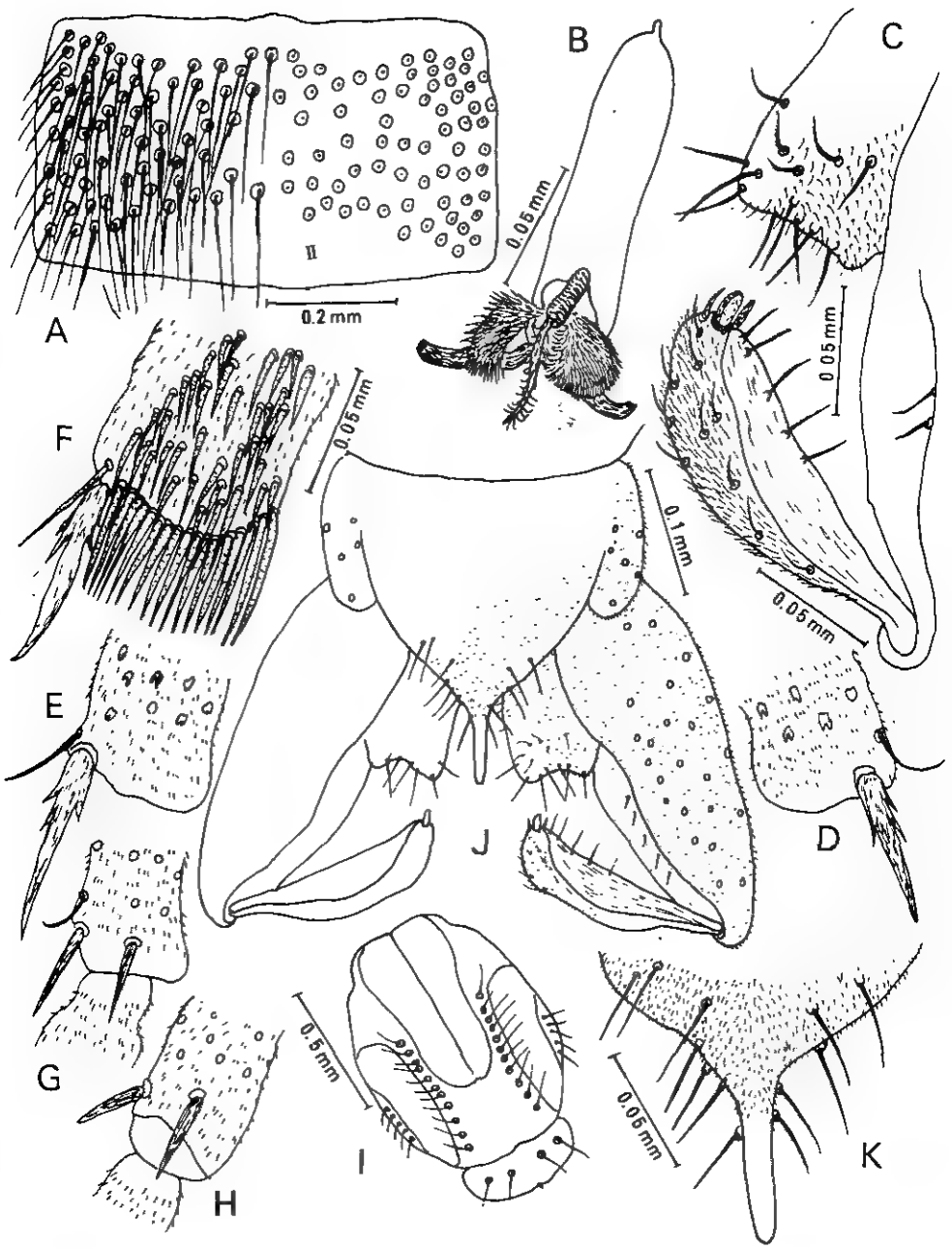

Fig. 65. ***Psectrocladius yunoquartus*, sp. nov. Male.**

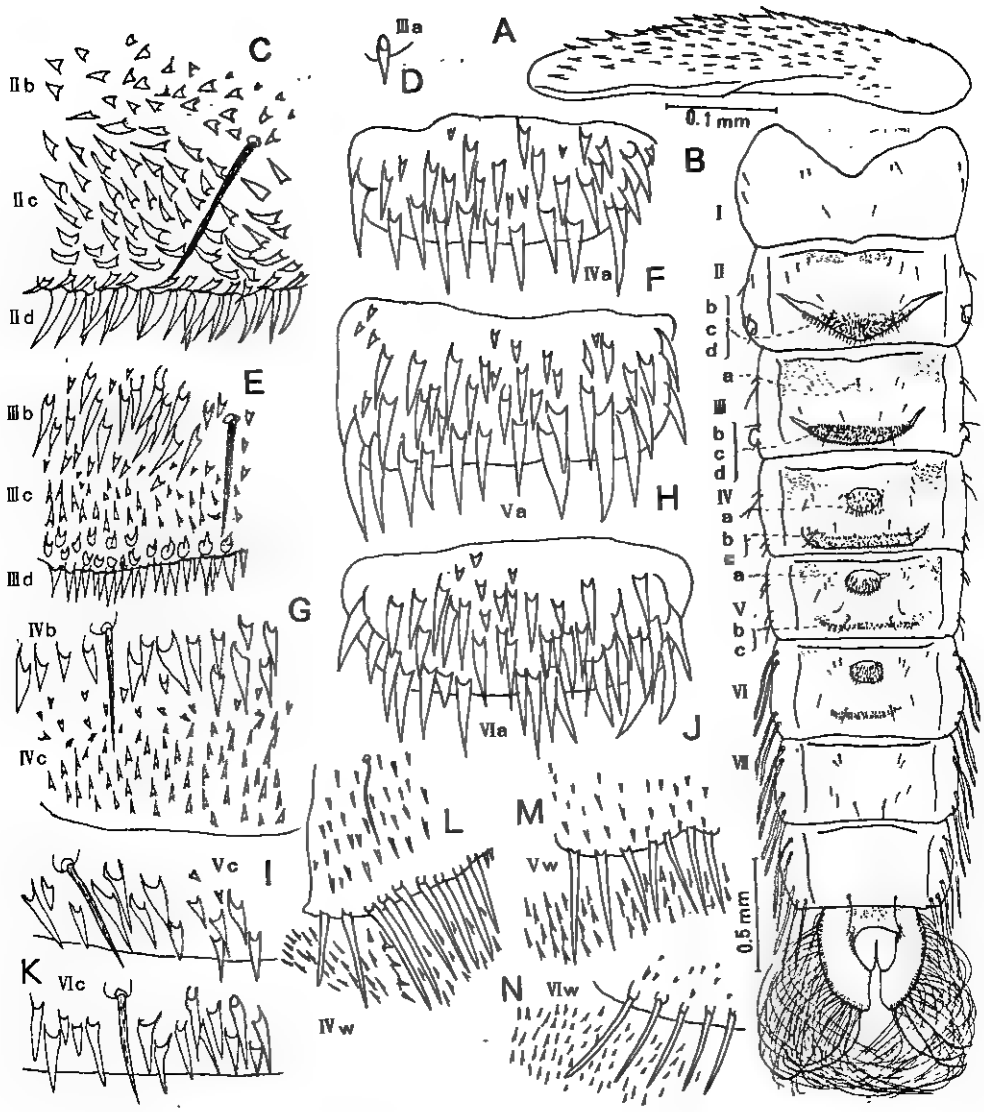

Fig. 66. *Psectrocladius yunoquartus*, sp. nov. Pupa.

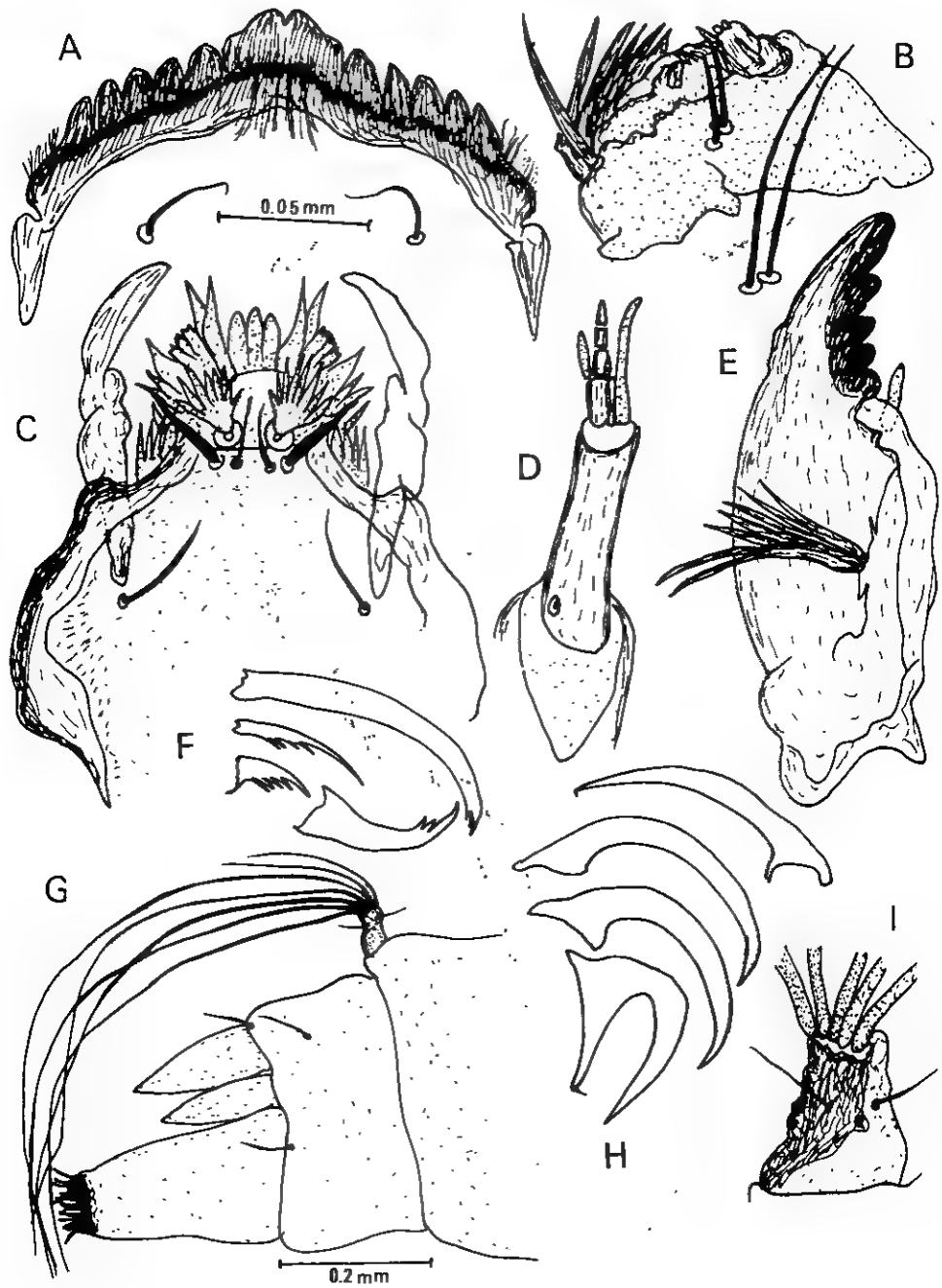

Fig. 67. ***Psectrocladius yunoquartus,*** **sp. nov. Larva.**

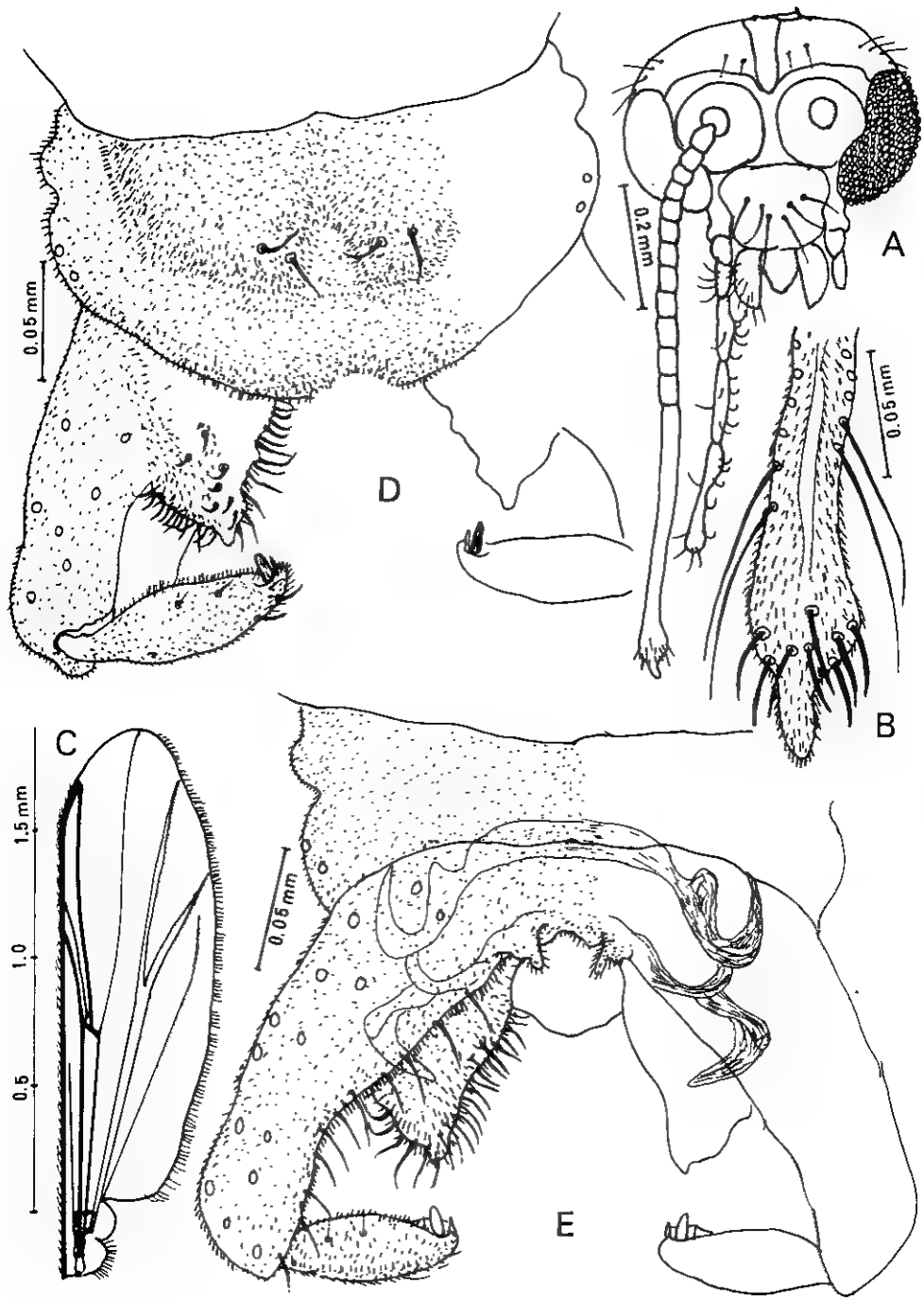

Fig. 68. ***Eukiefferiella chuzeoctauas*, sp. nov. Male.**

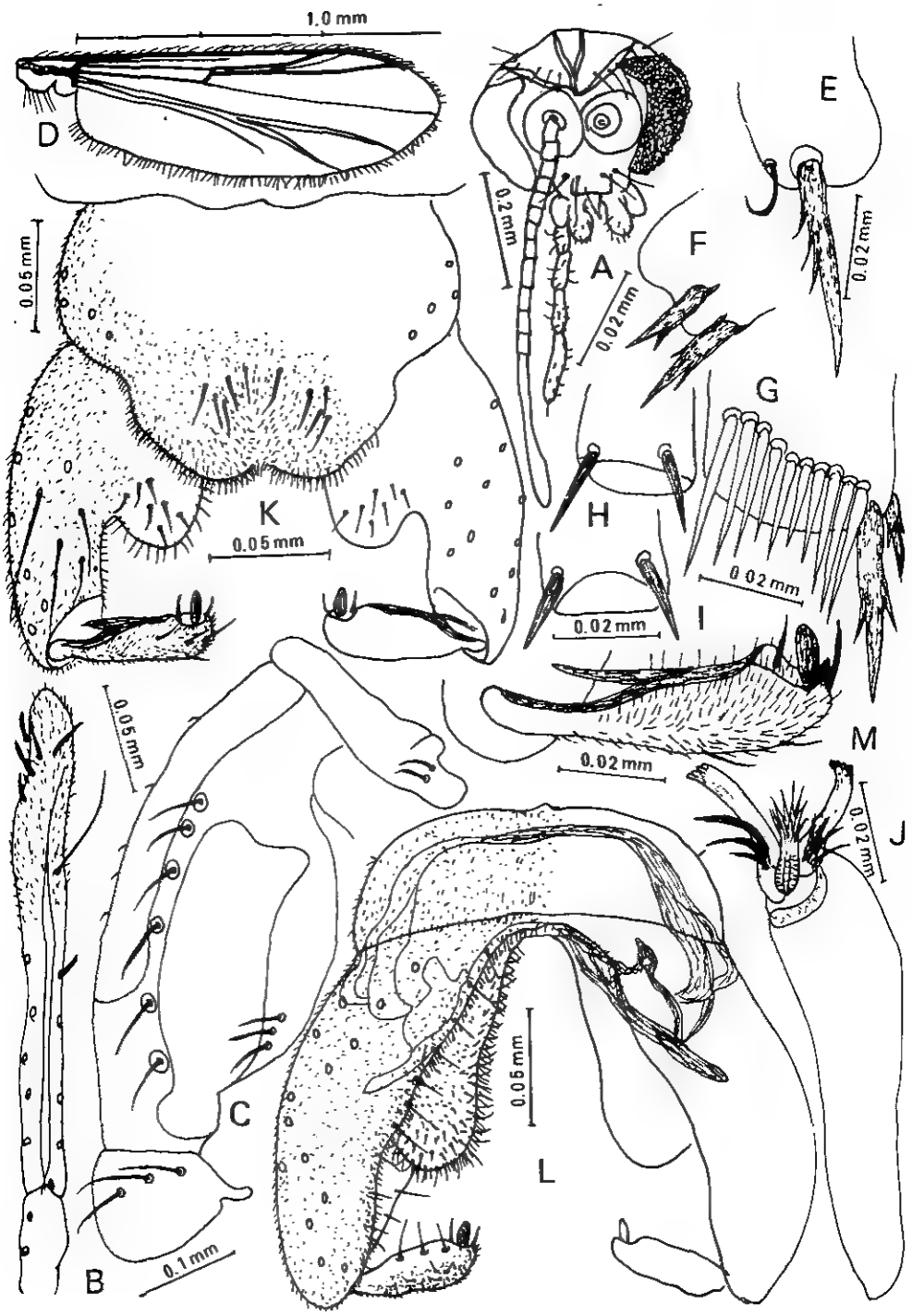

Fig. 69. ***Eukiefferiella chuzenonus,*** **sp. nov. Male.**

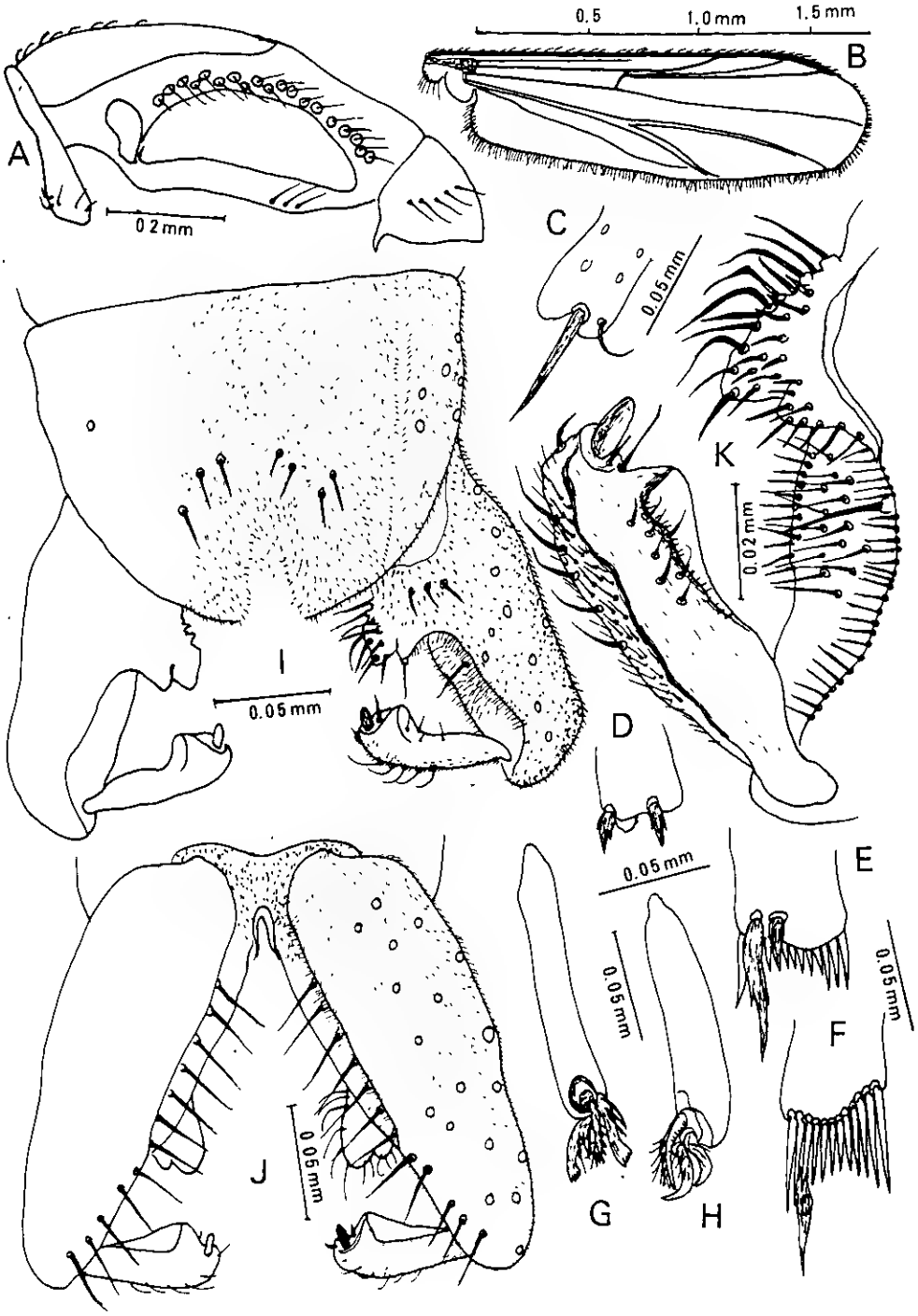

Fig. 70. *Paratrichocladius tamaater*, Sasa. Male.

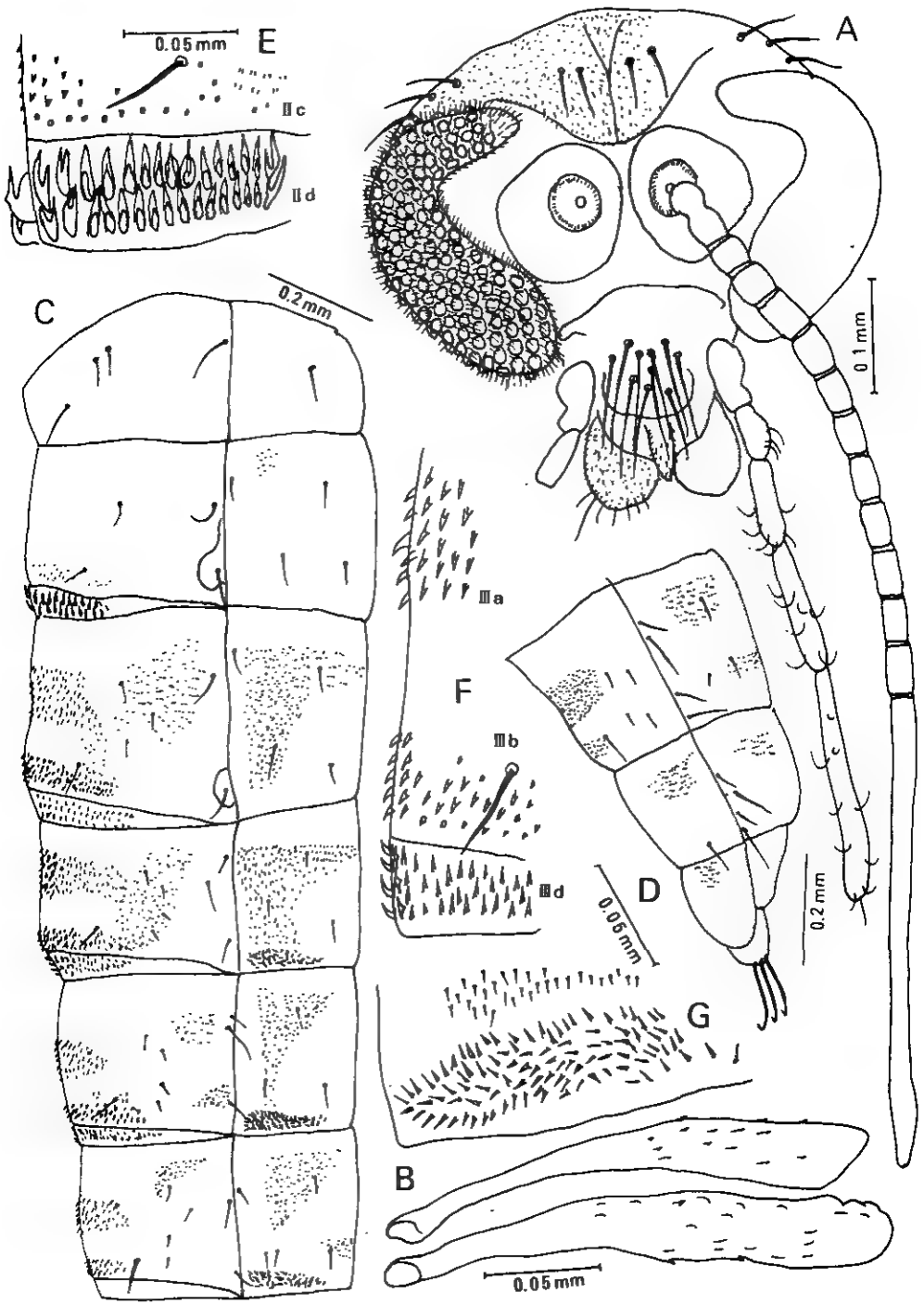

Fig. 71. ***Paratrichocladius tamaater,*** **Sasa.**

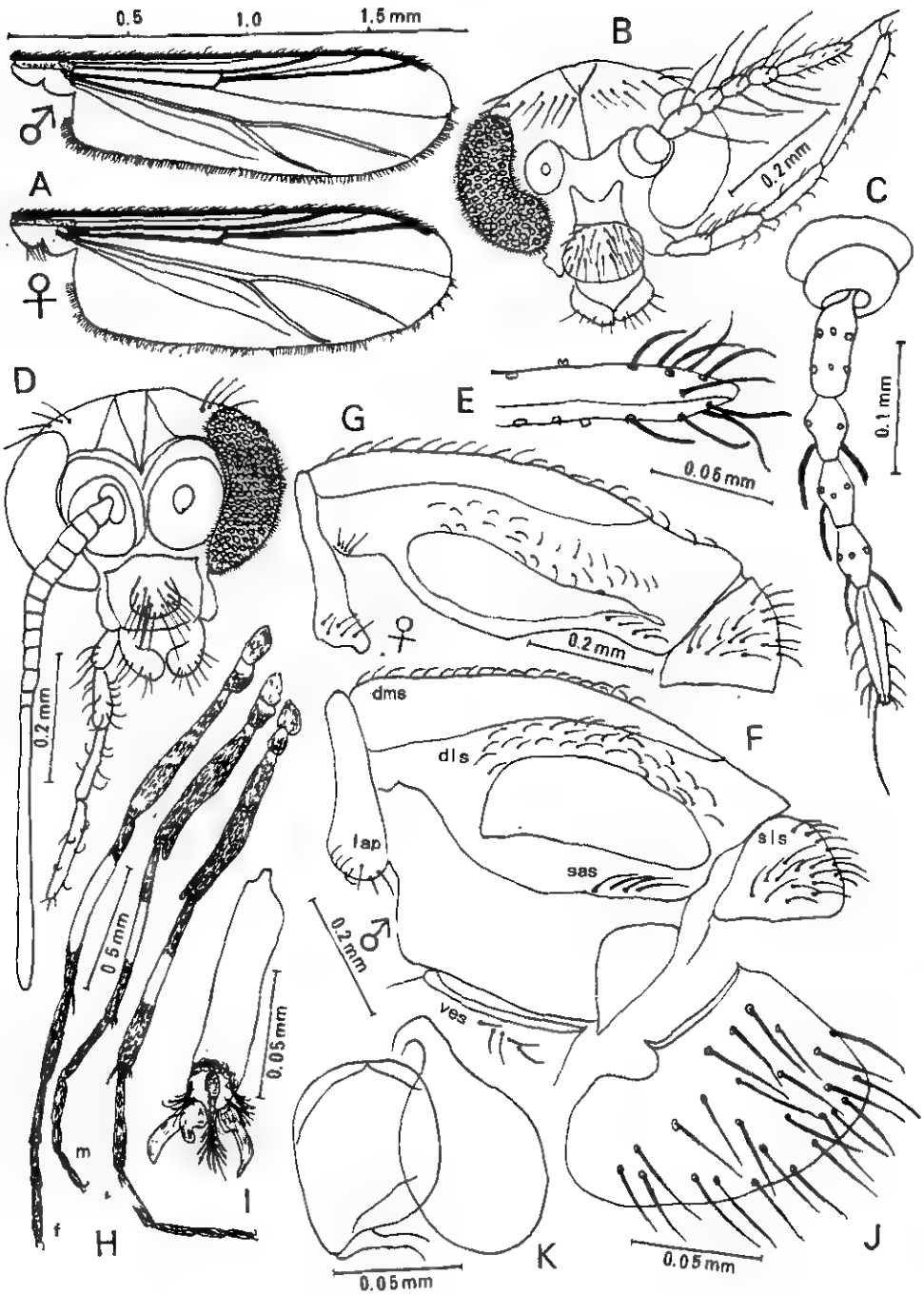

Fig. 72. ***Cricotopus yunoquintus*, sp. nov. Adult.**

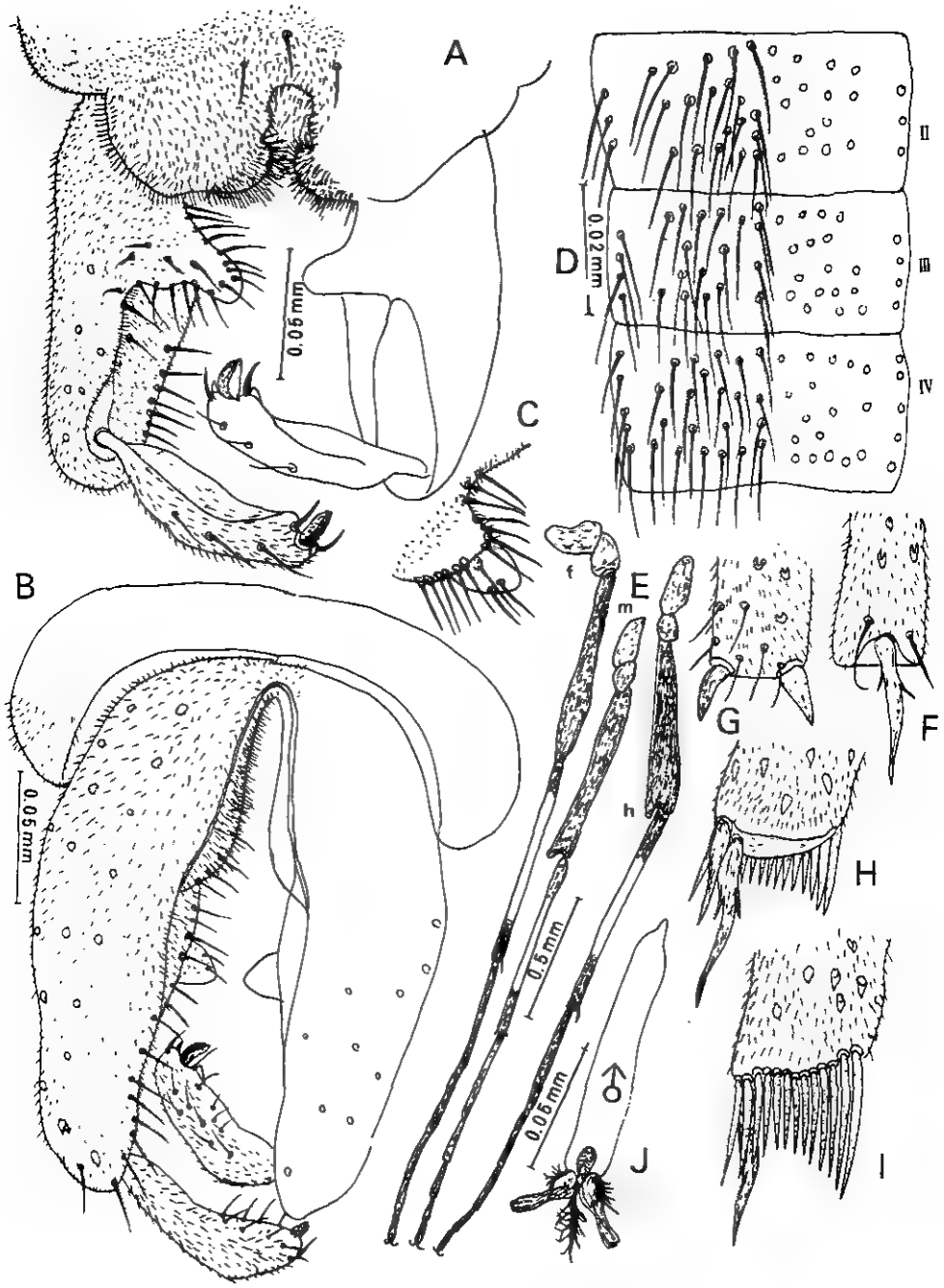

Fig. 73. ***Cricotopus, yunoquintus,*** **sp. nov. Male.**

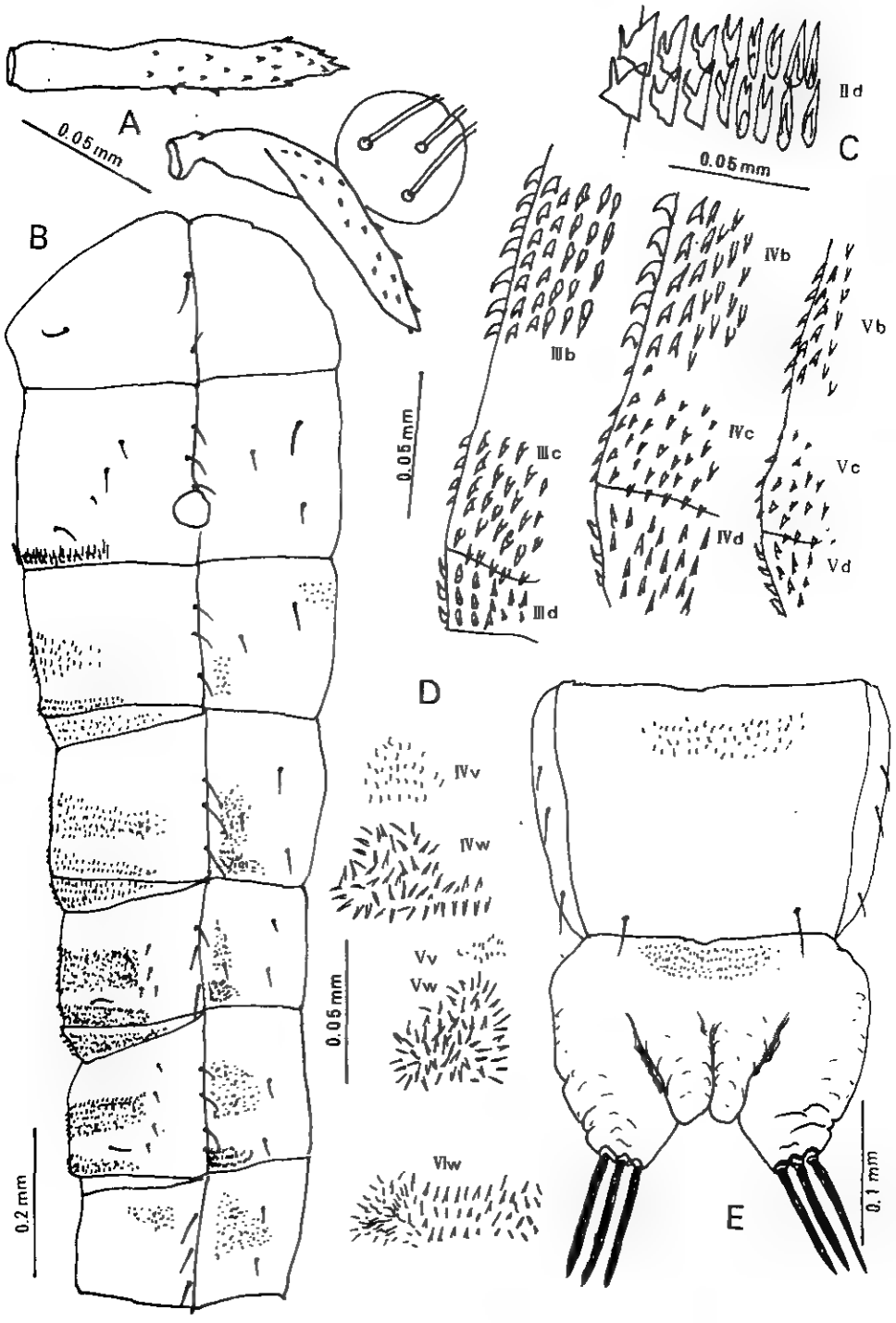

Fig. 74. ***Cricotopus, yunoquintus,*** **sp. nov. Pupa.**

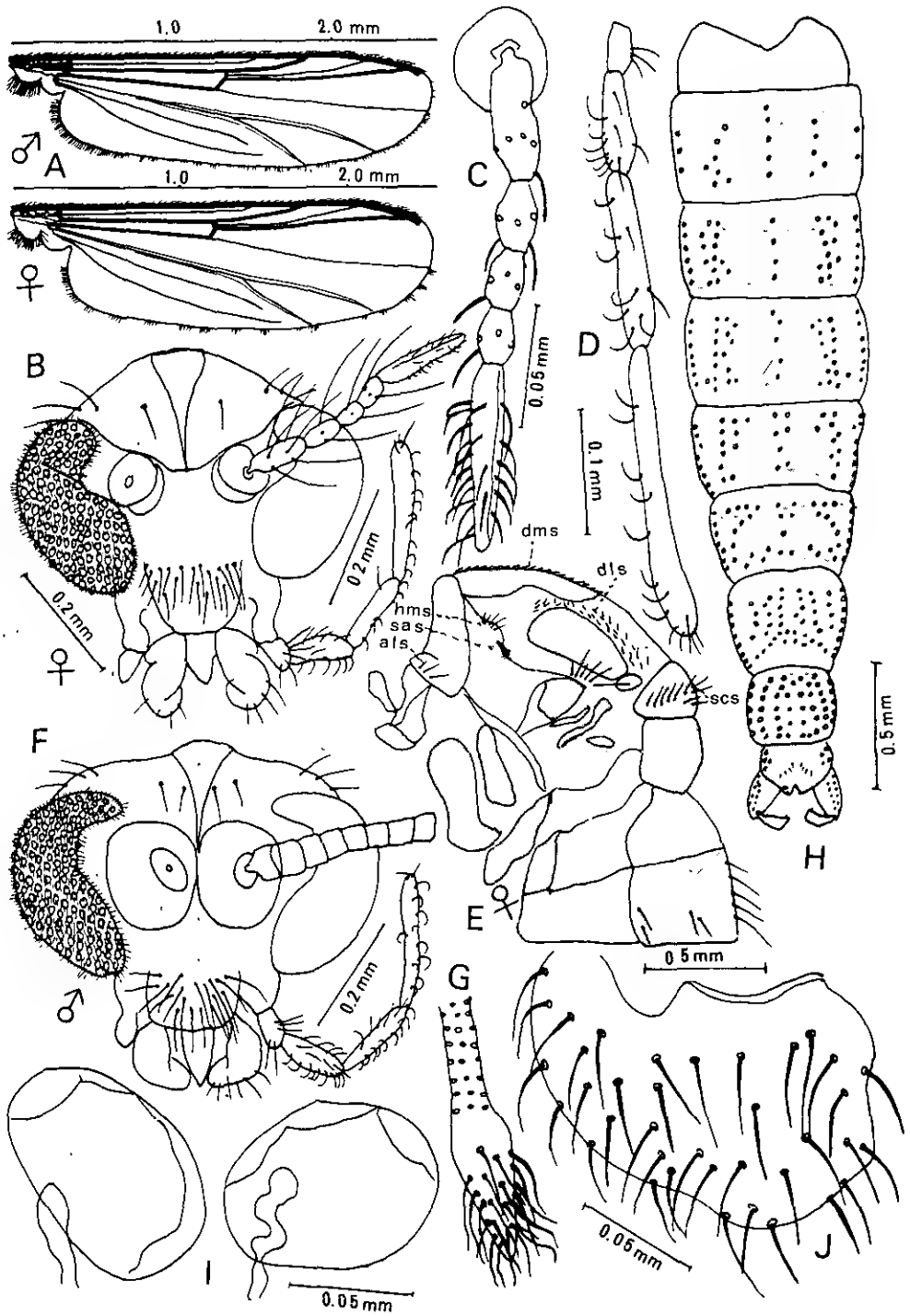

Fig. 75. ***Cricotopus, trifasciatus*** **(Meigen), Adult.**

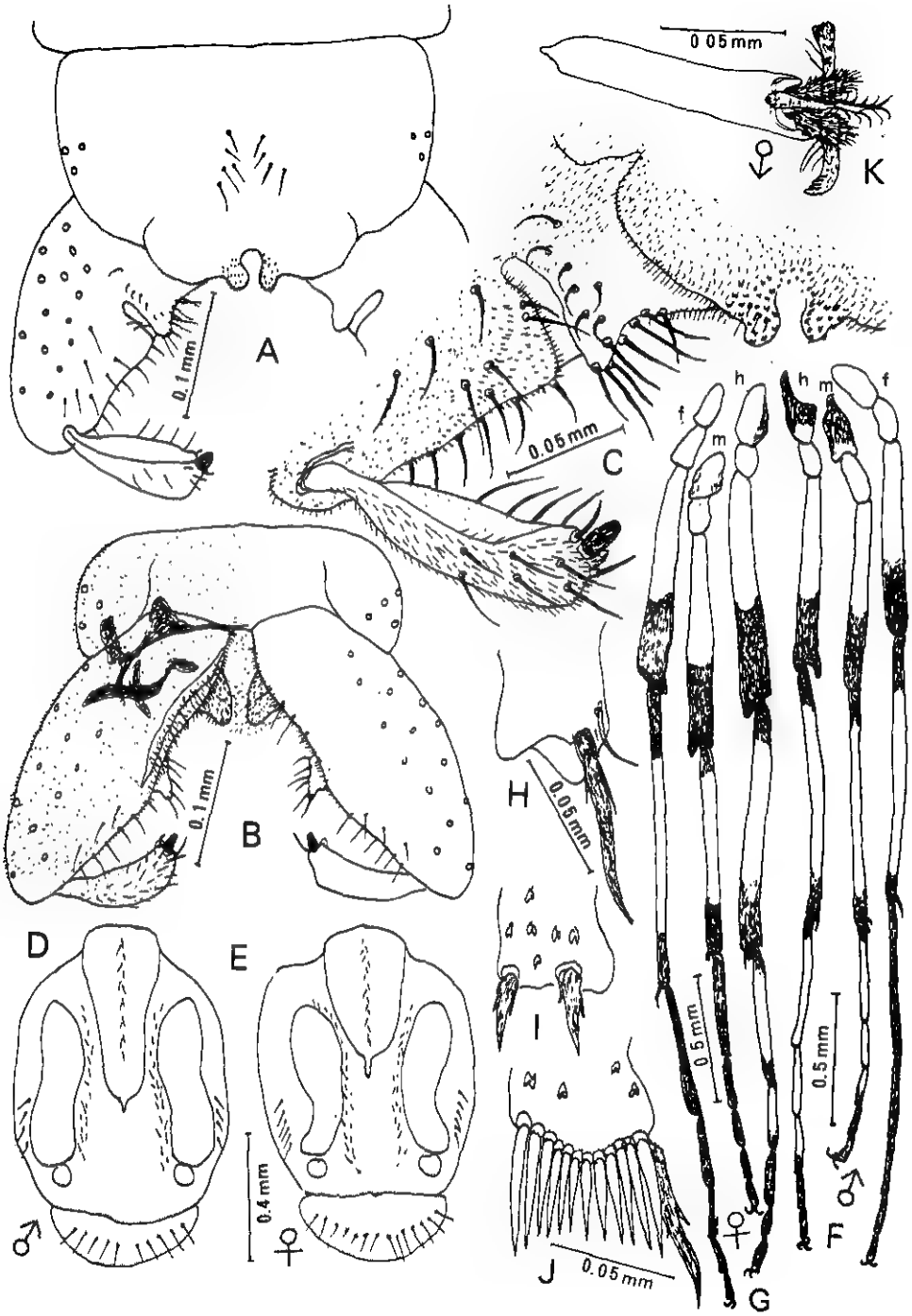

Fig. 76. ***Cricotopus trifasciatus*** **(Meigen). Adult.**

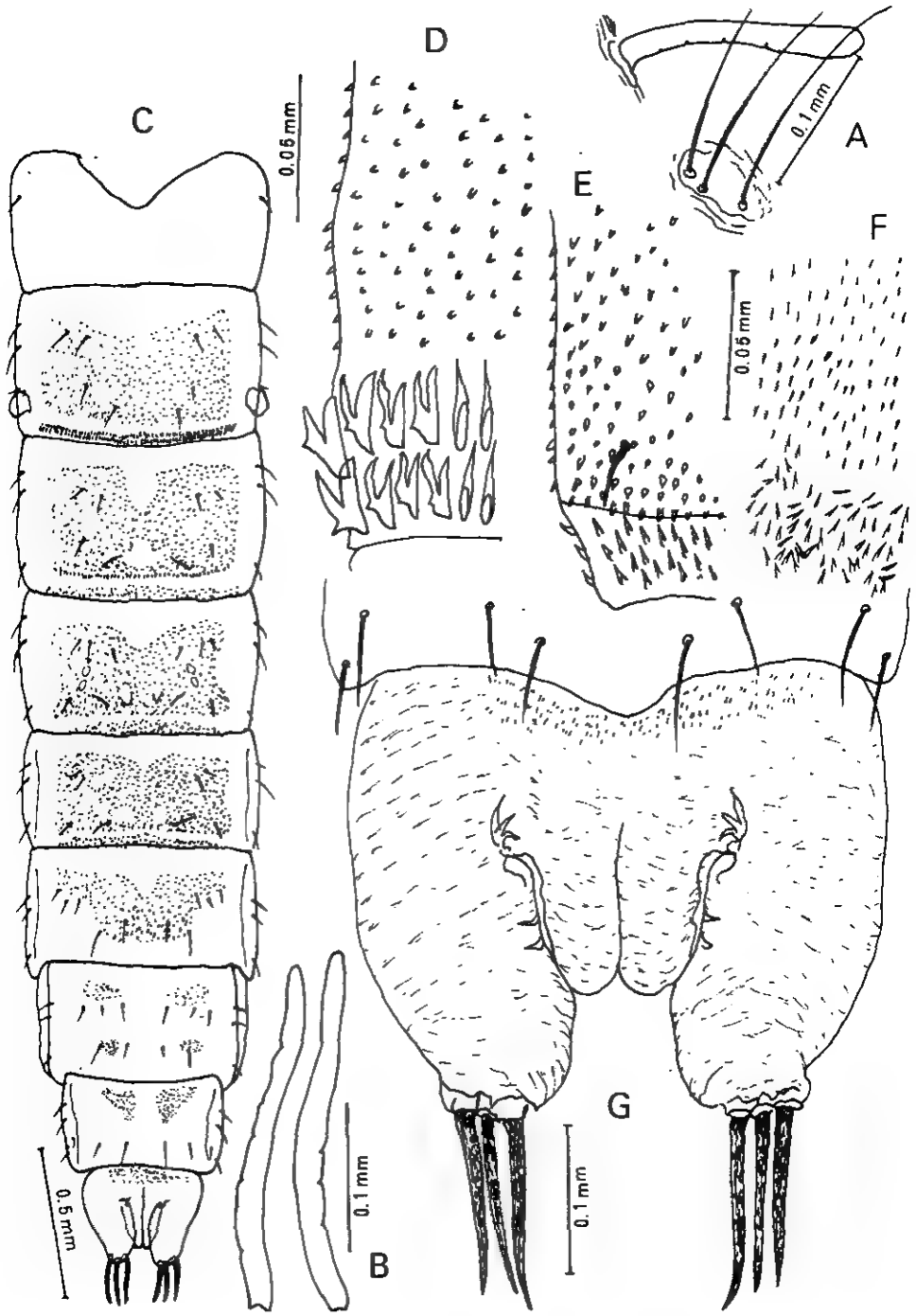

Fig. 77. ***Cricotopus, trifasciatus*** **(Meigen). Pupa.**

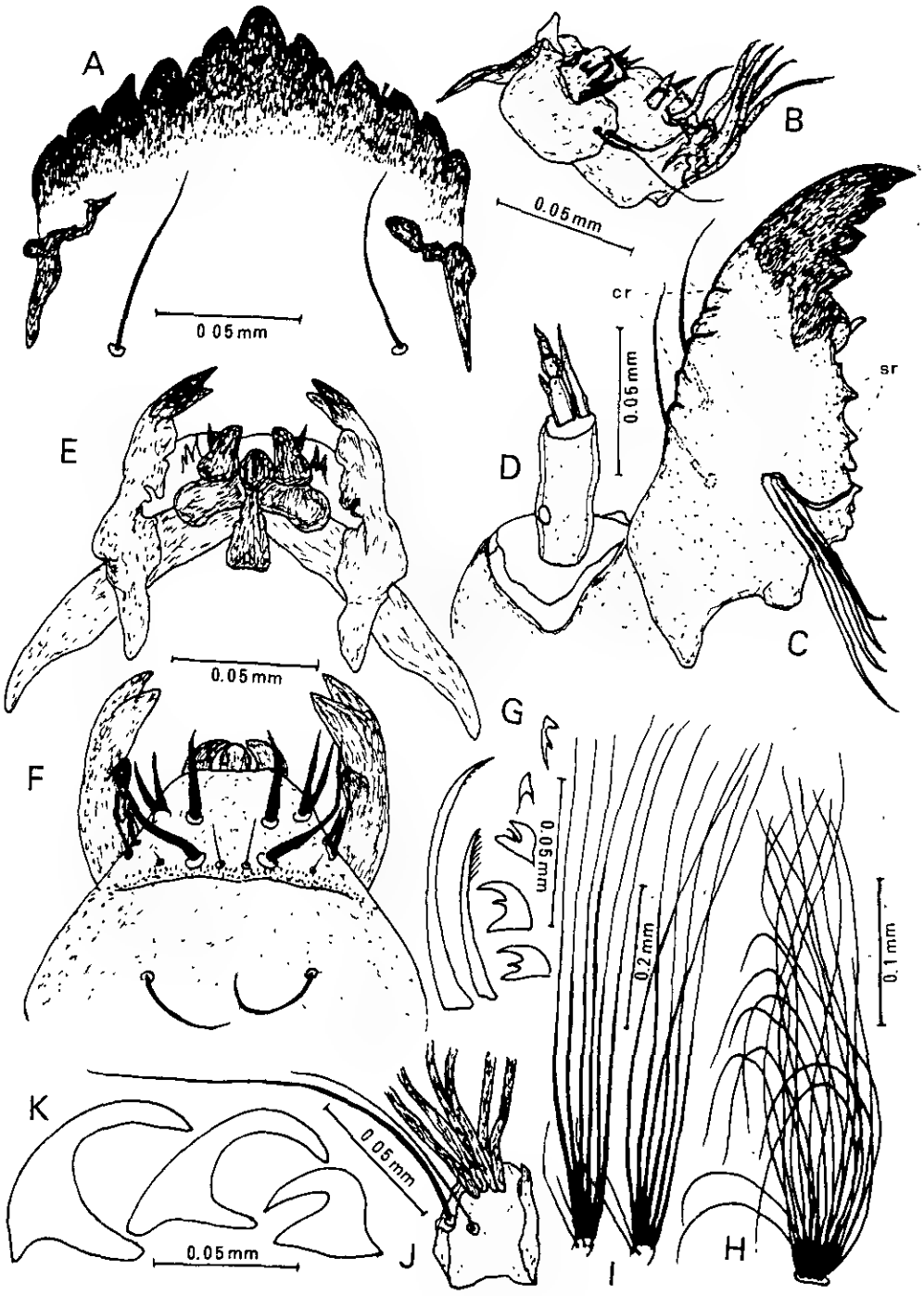

Fig. 78. *Cricotopus trifasciatus,* (Meigen). Larva.

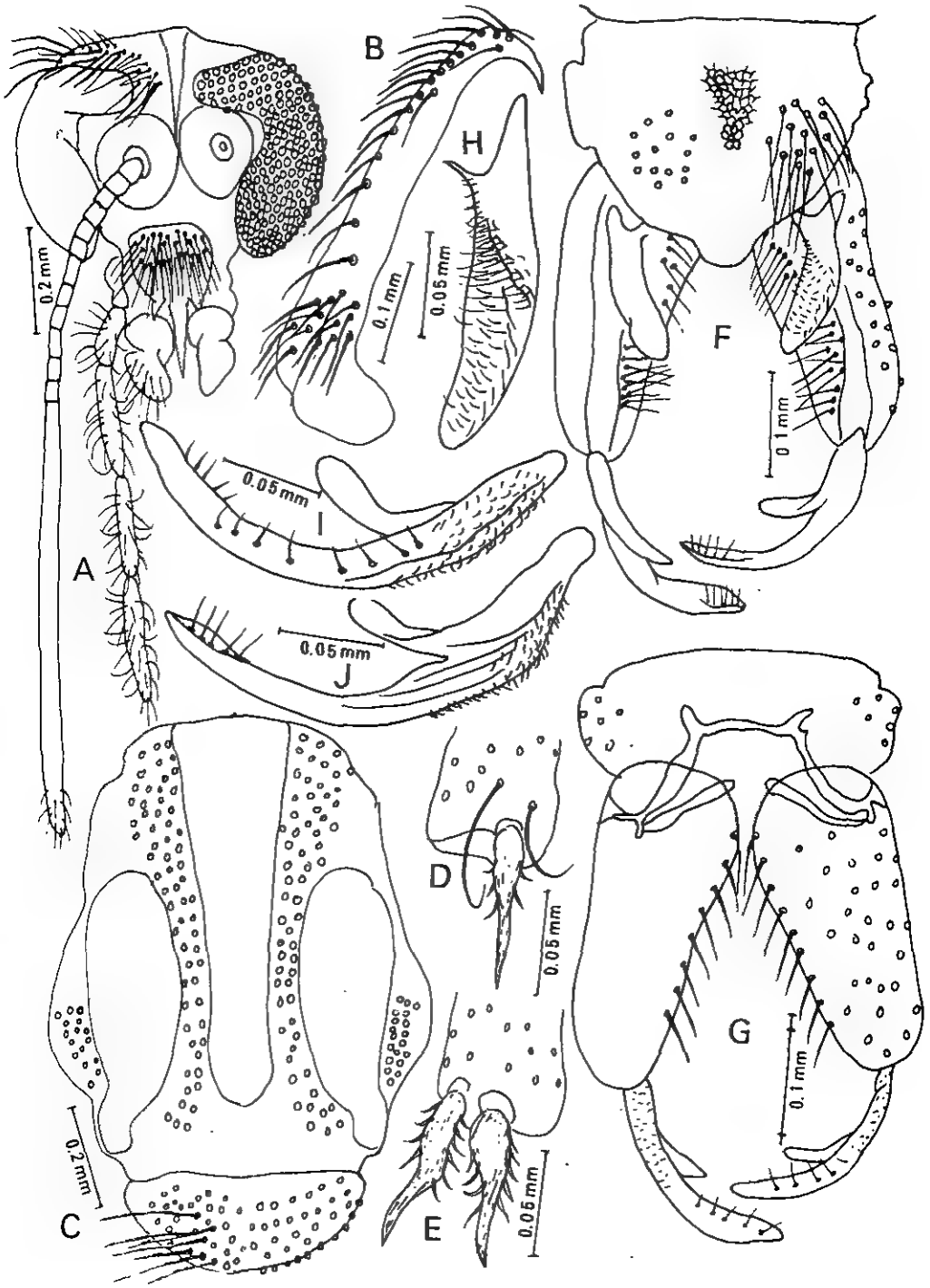

Fig. 79. *Brillia, longifurca,* Kieffer. Male.

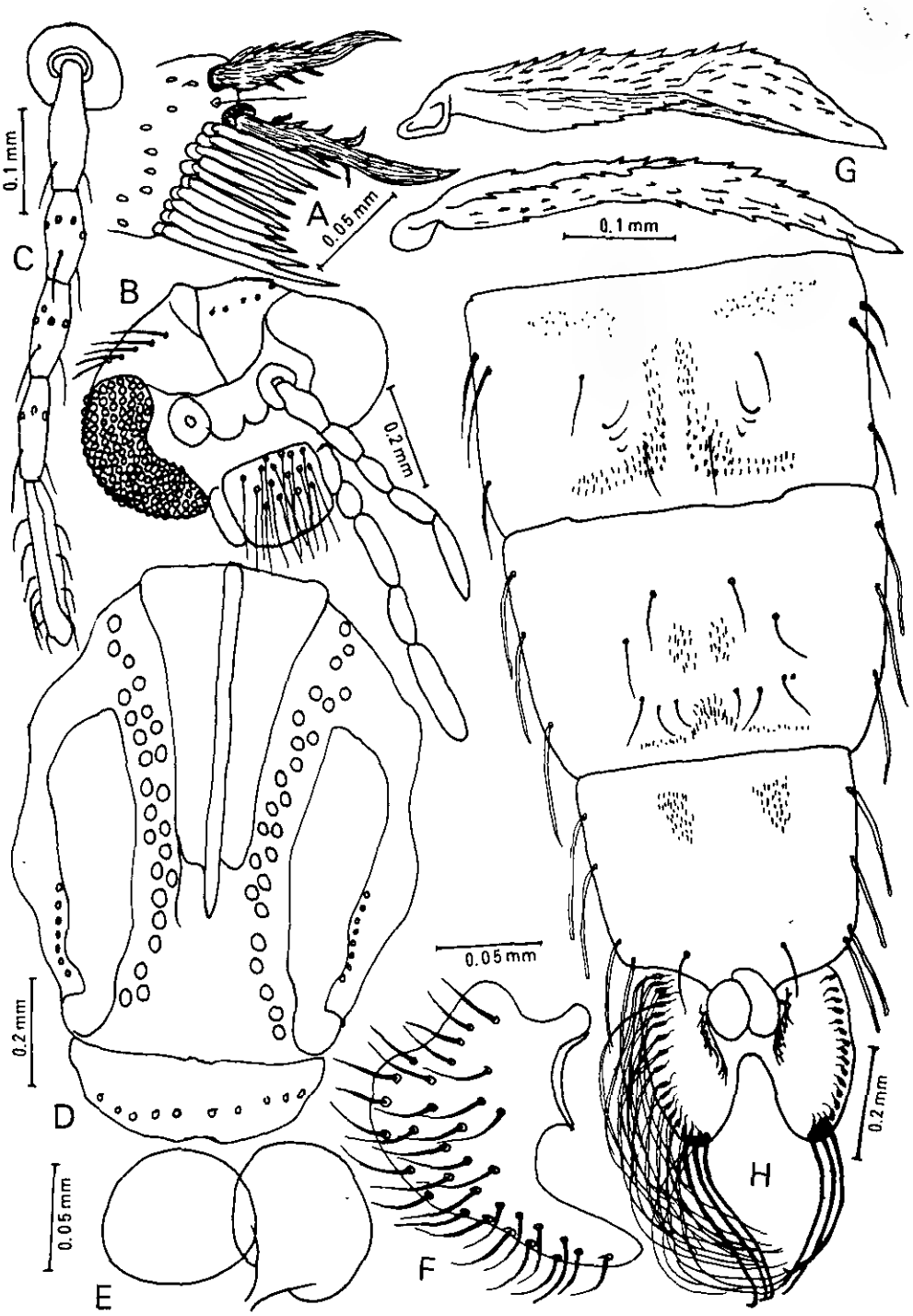

Fig. 80. *Brillia longifurca*, Kieffer.

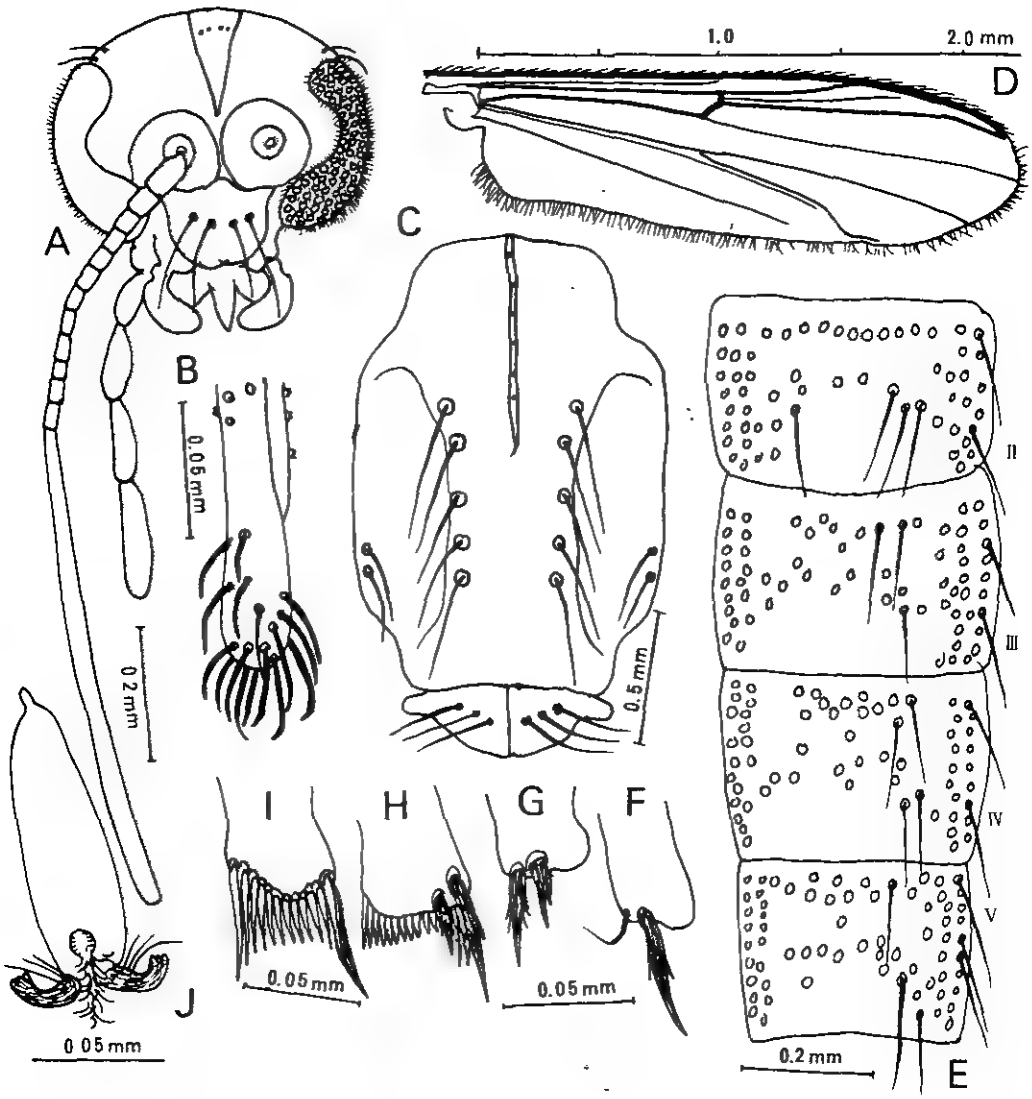

Fig. 81. ***Diplocladius cultriger*, Kieffer, Male.**

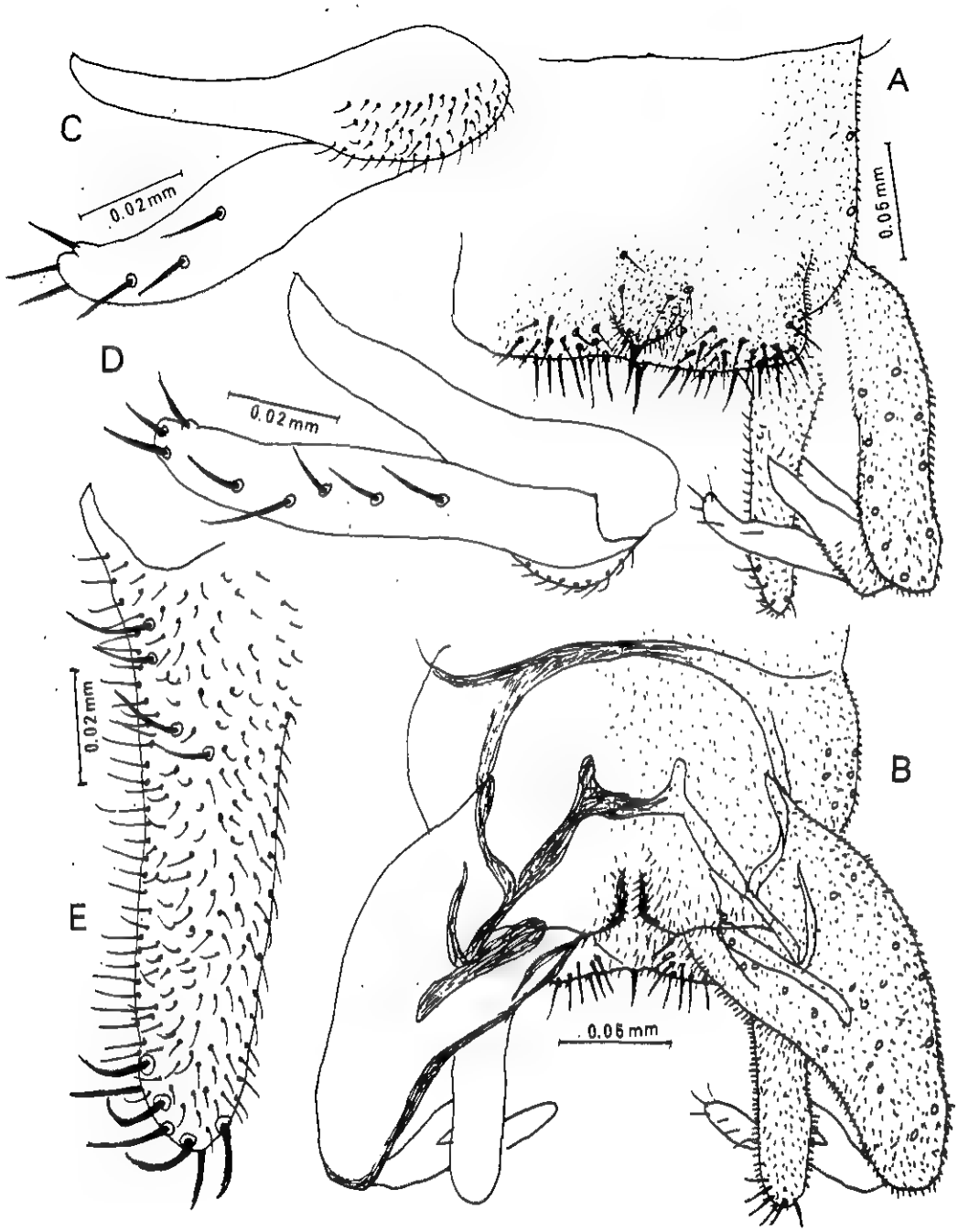

Fig. 82. *Diplocladius cultiger,* Kieffer. Male.

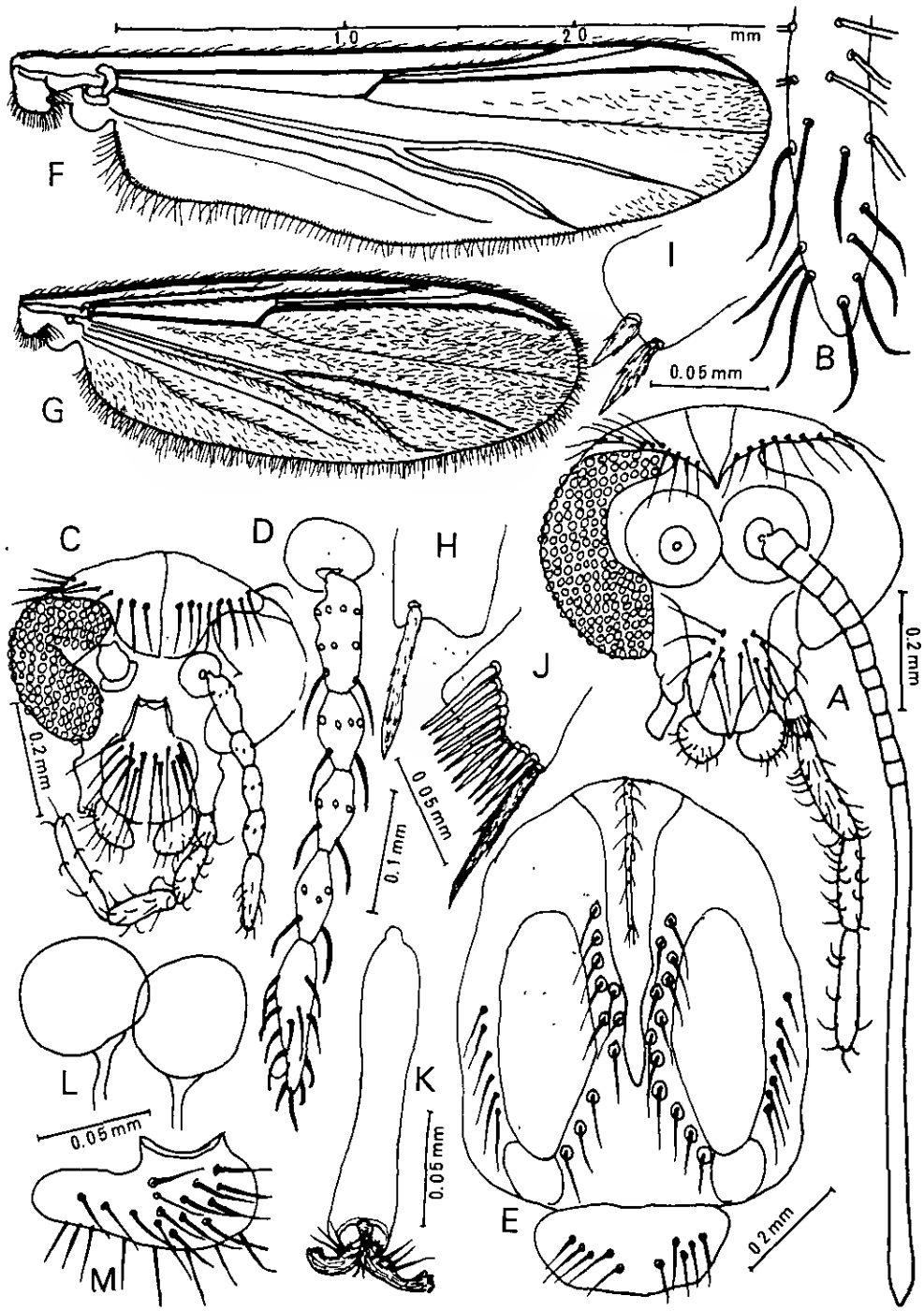

Fig. 83. ***Parametriocnemus chuzedecimus,*** **sp. nov. Adult.**

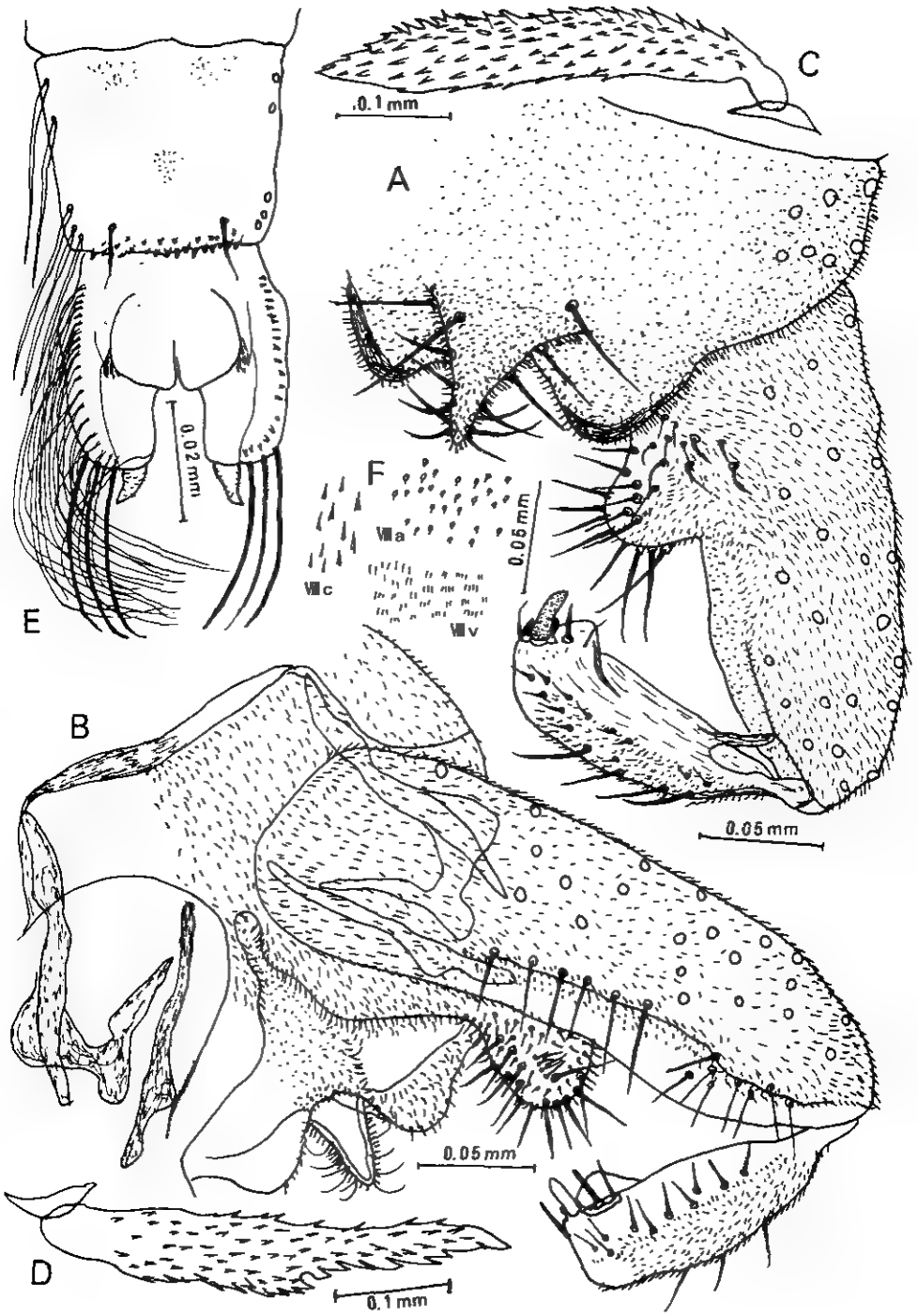

Fig. 84. ***Parametriocnemus chuzedecimus*, sp. nov.**

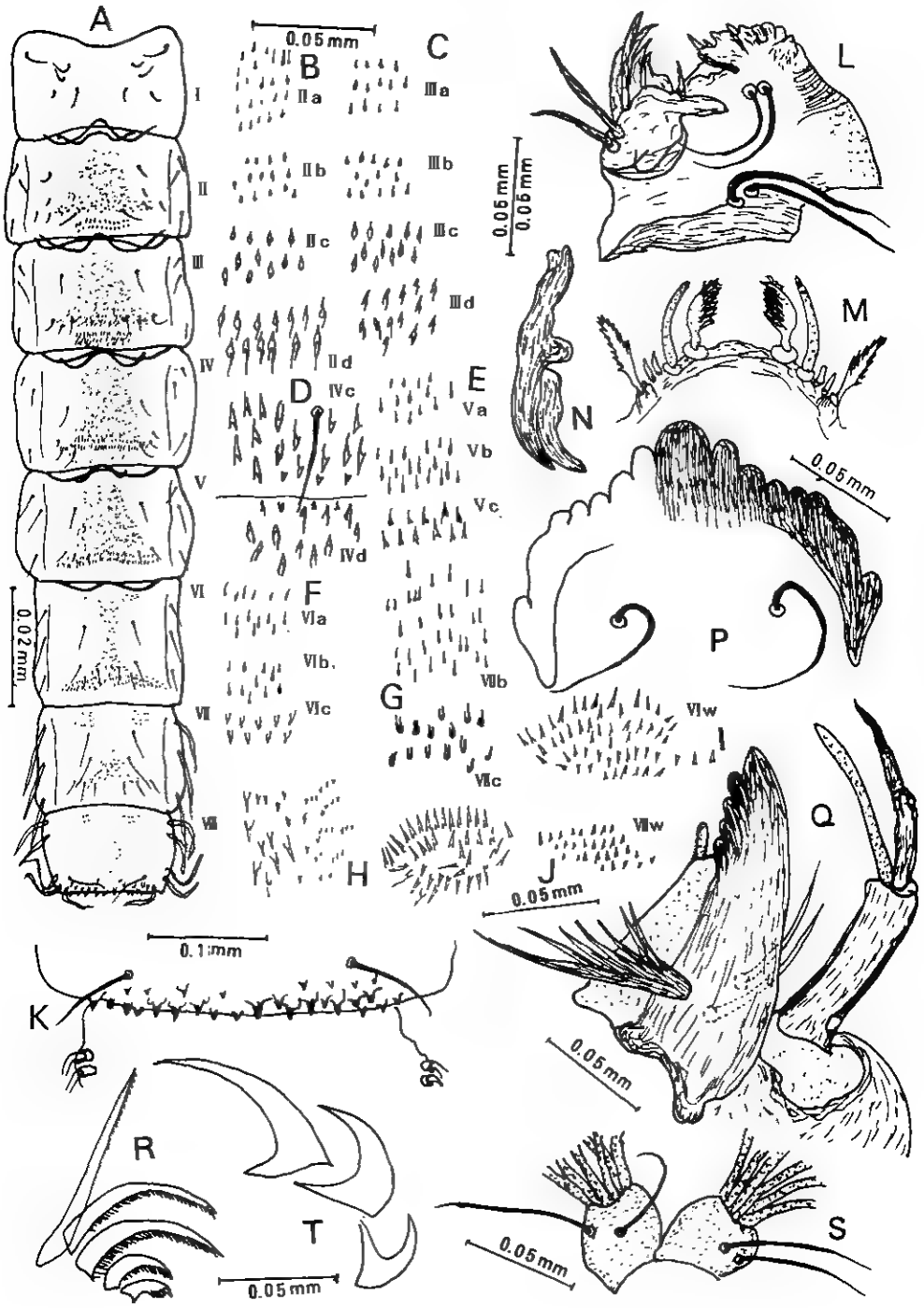

Fig. 85. ***Parametriocnemus chuzedecimus*, sp. nov.**
Pupa, (A-K). Larva (L-T)

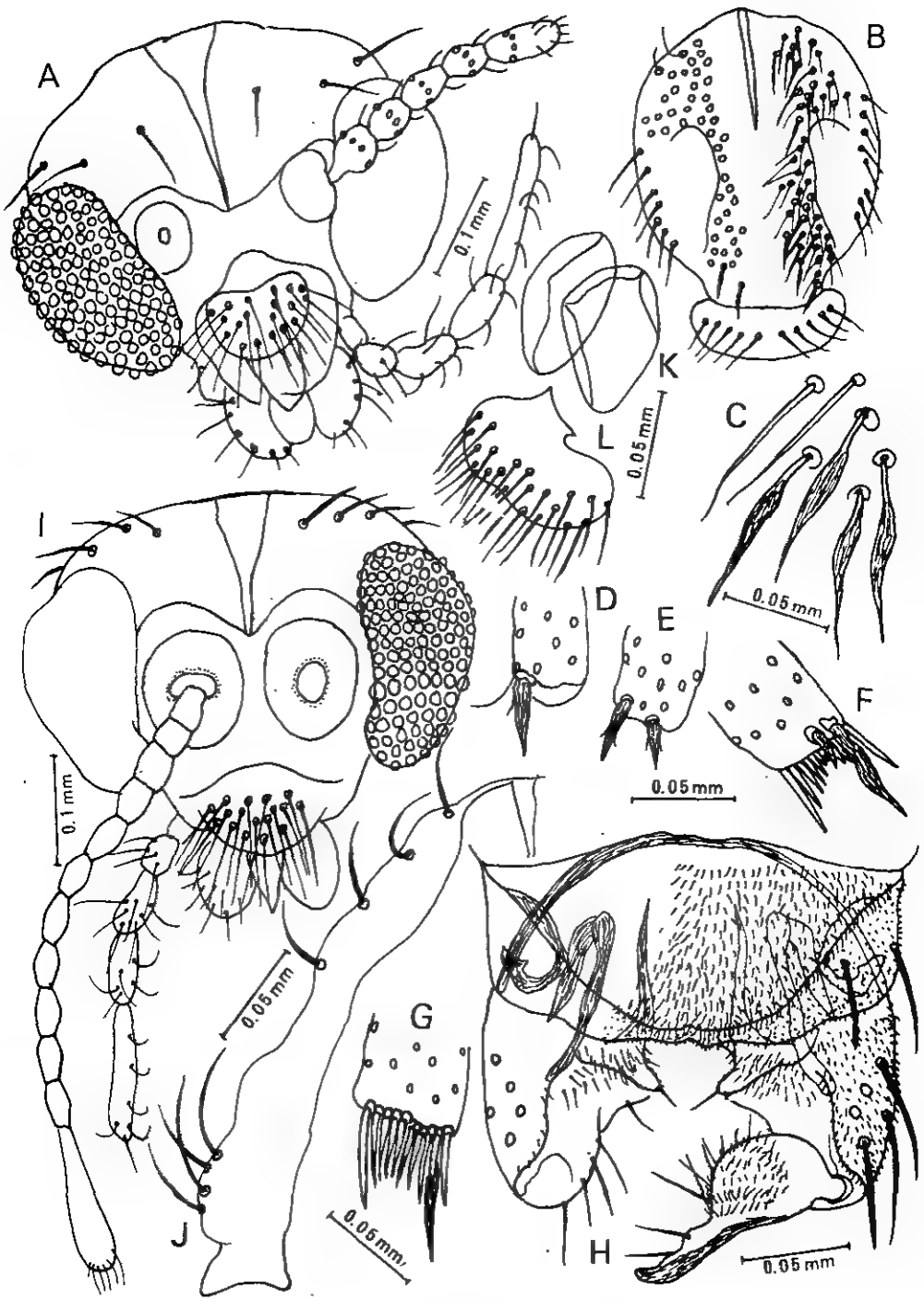

Fig. 86. ***Limnophyes tamakireides*, Sasa.**
Male (A-H). Female (I-L)

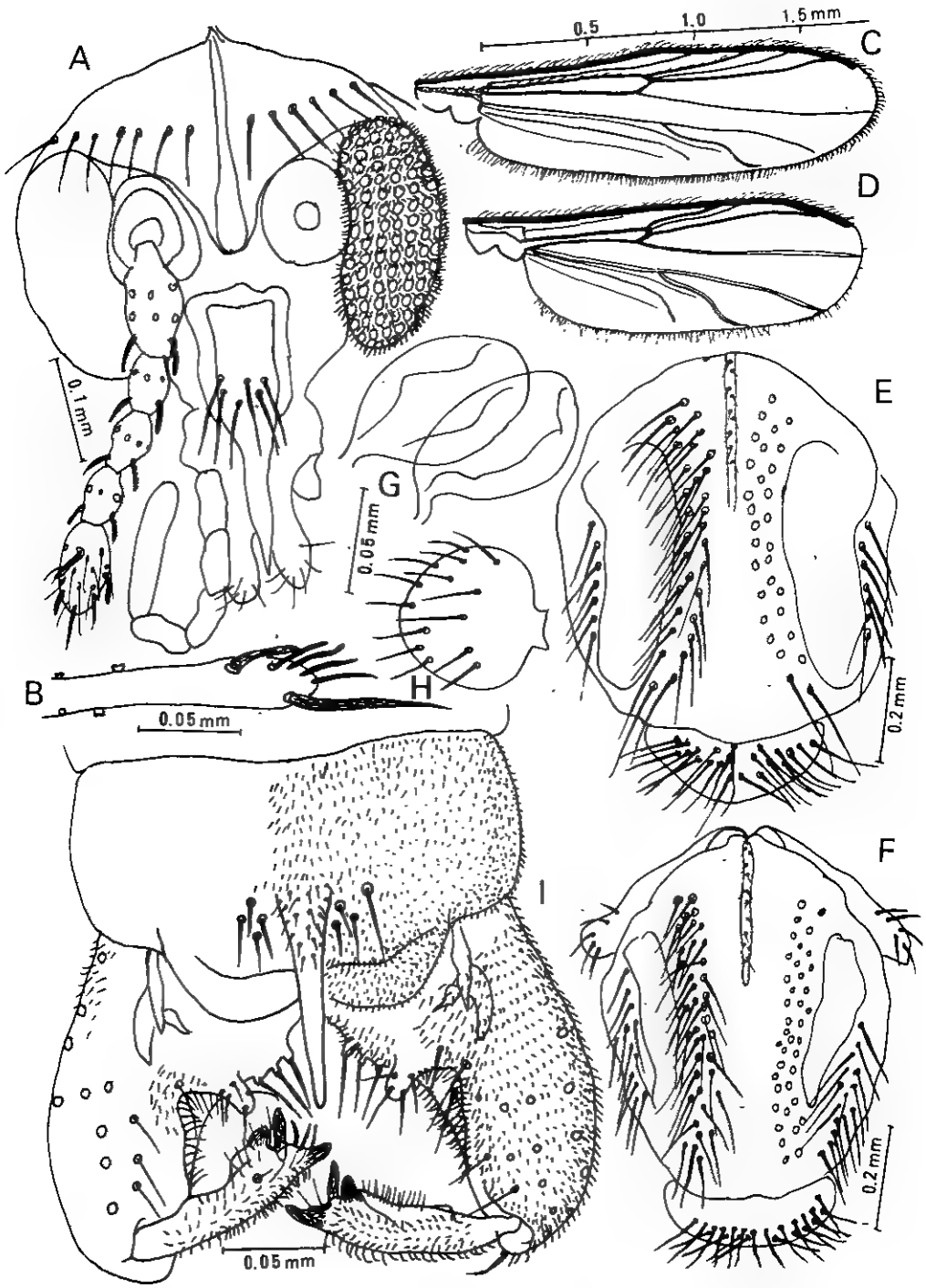

Fig. 87. ***Smittia sainokoensis,*** **sp. nov. Adult.**

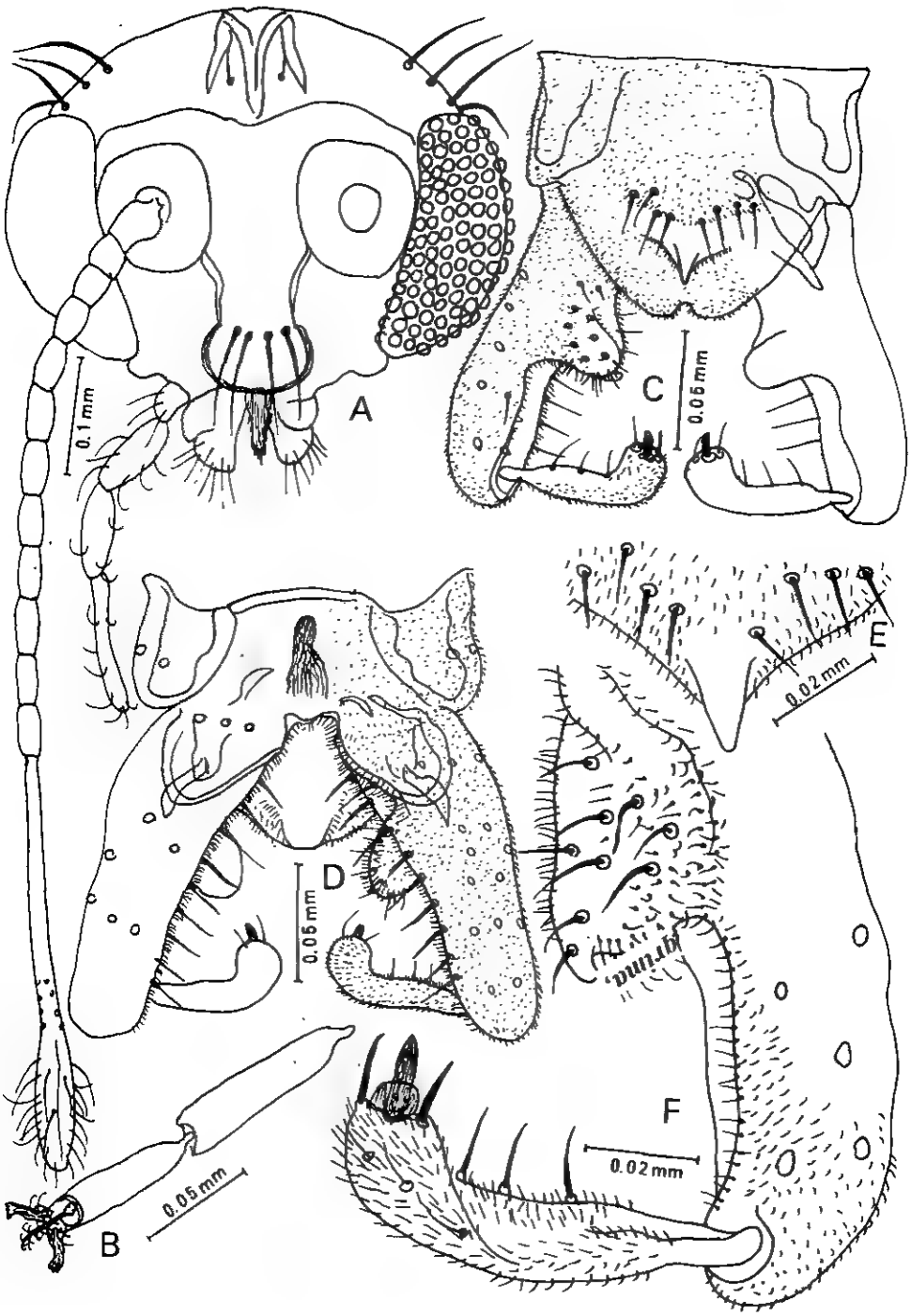

Fig. 88. ***Epoicocladius chuzeundecimus,*** **sp. nov. Male.**

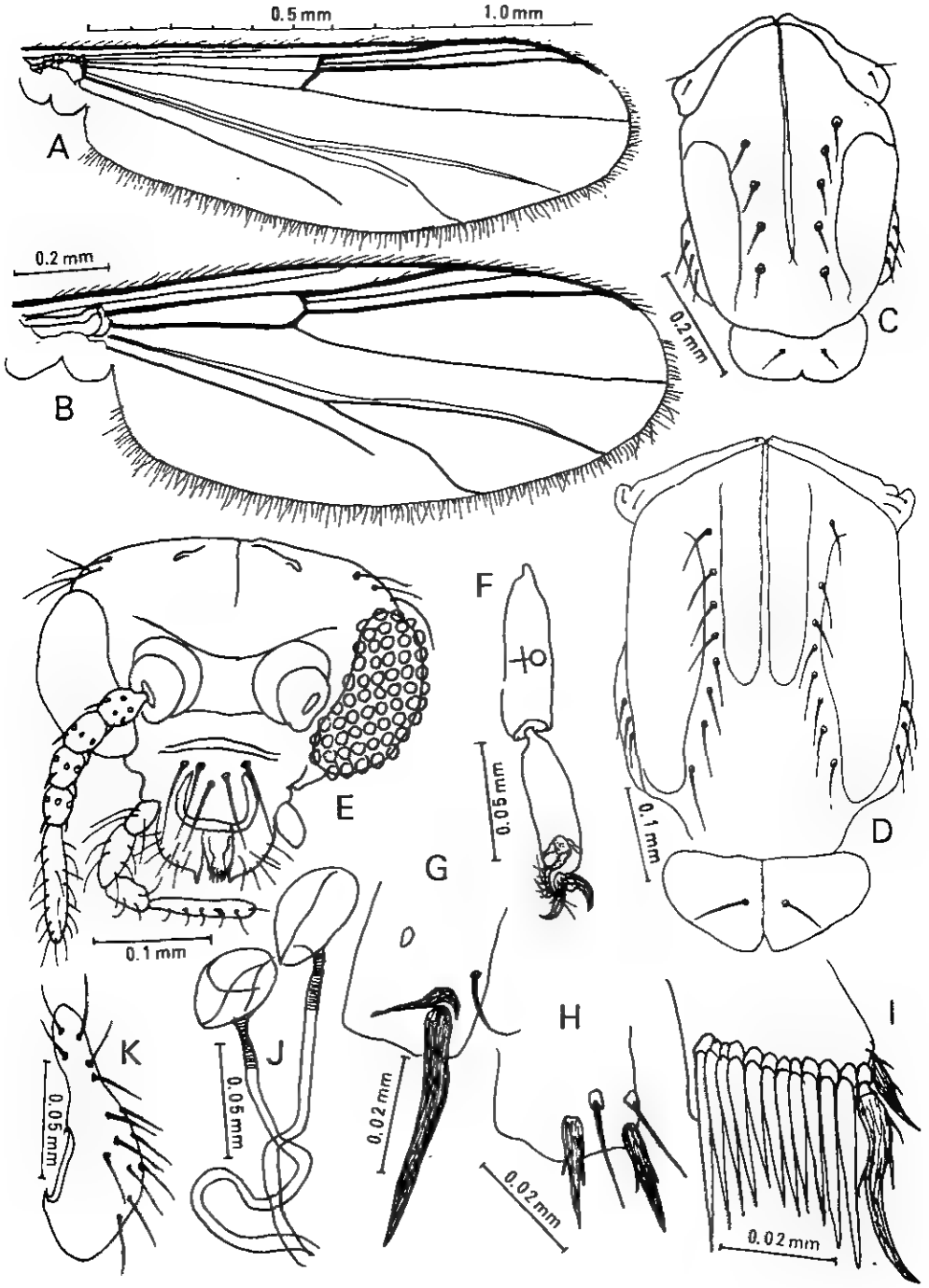

Fig. 89. ***Epoicocladius, chuzeundecimus,*** **sp. nov. Adult.**

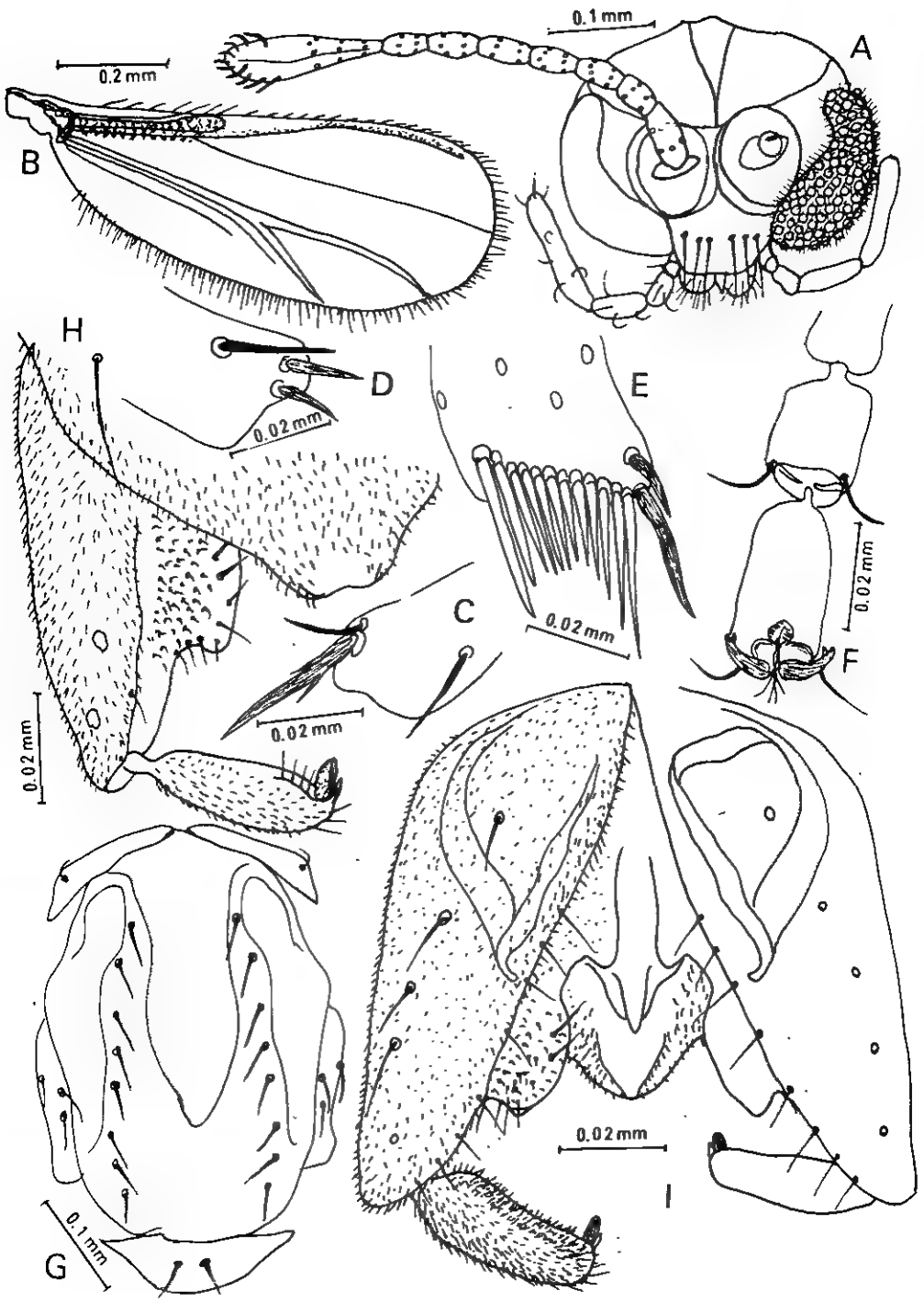

Fig. 90. ***Thienemanniella chuzeduodecimus,*** **sp. nov. Male.**

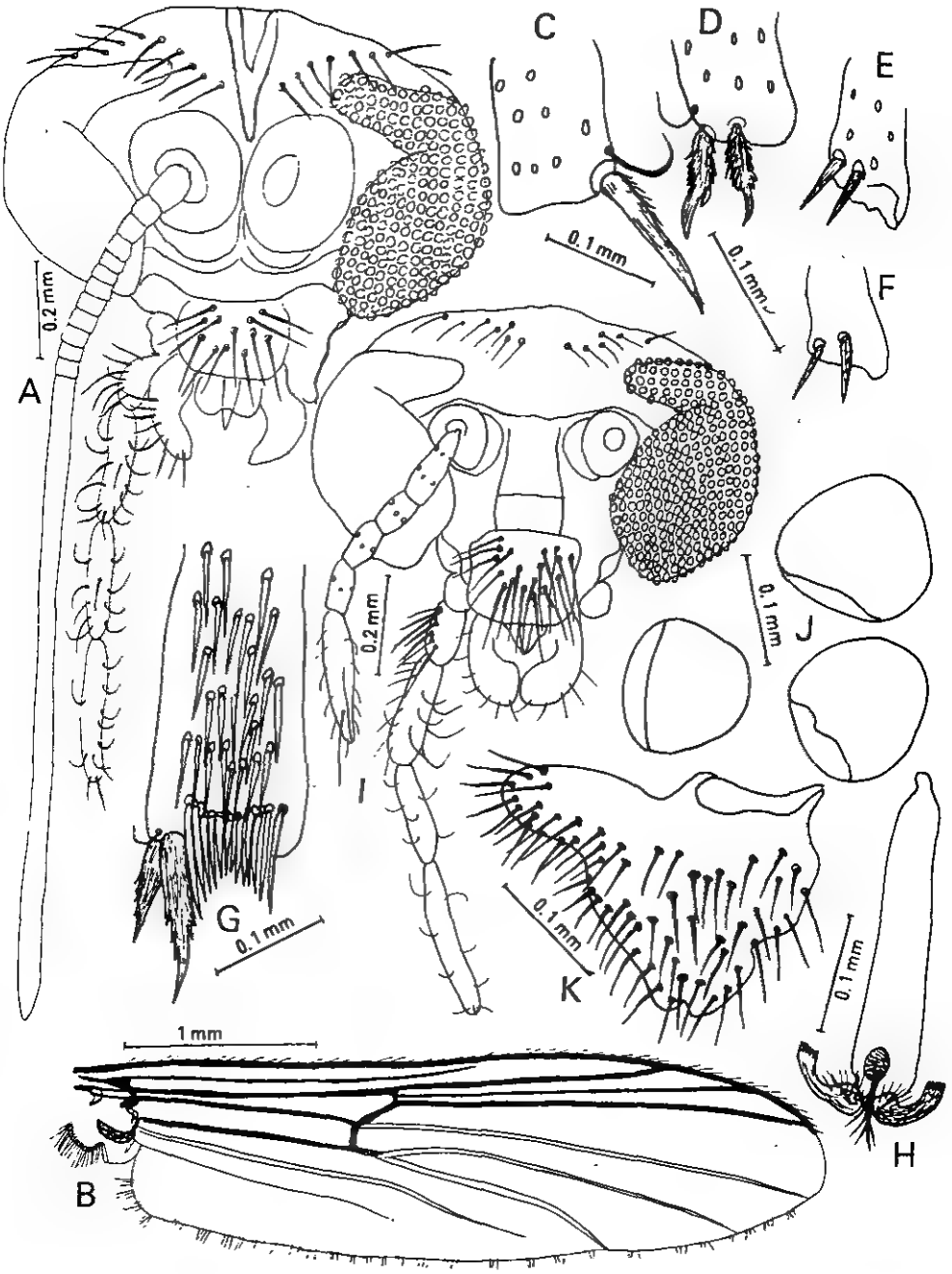

Fig. 91. ***Prodiamesa*** **sp. Male (A-H), Female (I-K).**

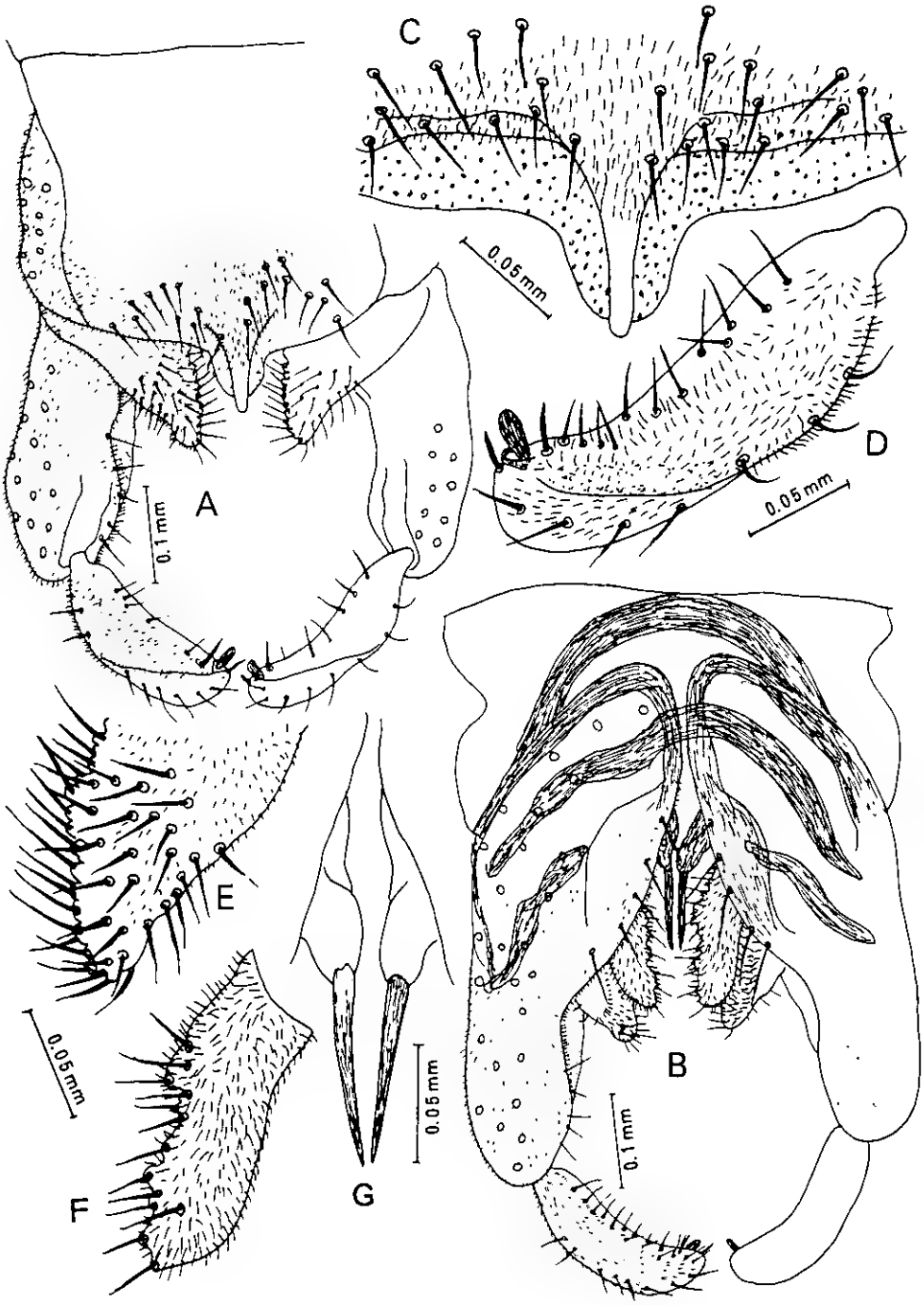

Fig. 92. ***Prodiamesa*** **sp. Male. hypopygium.**

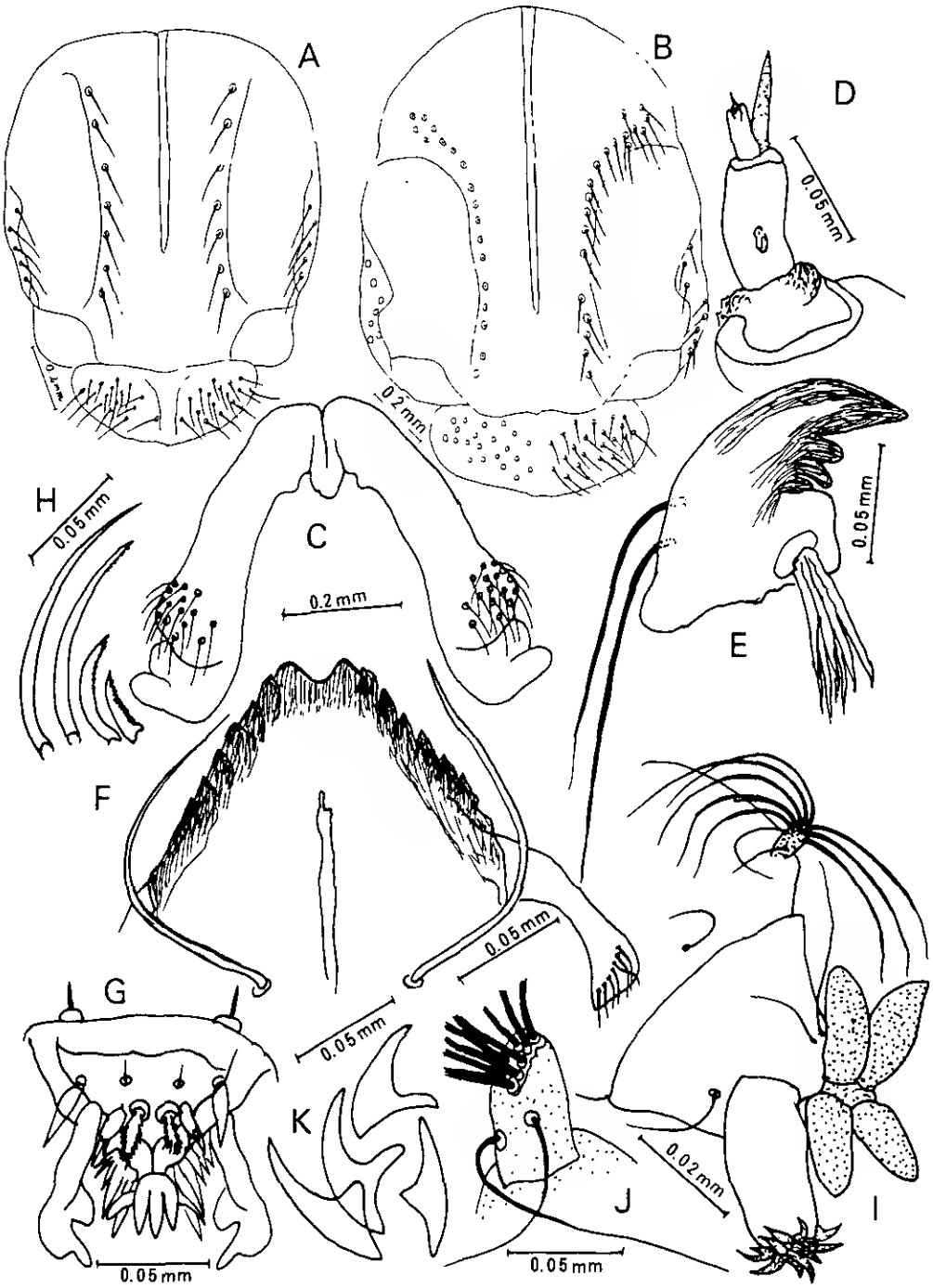

Fig. 93. ***Prodiamesa*** **sp. Adult (A-C), Larva (D-K)**

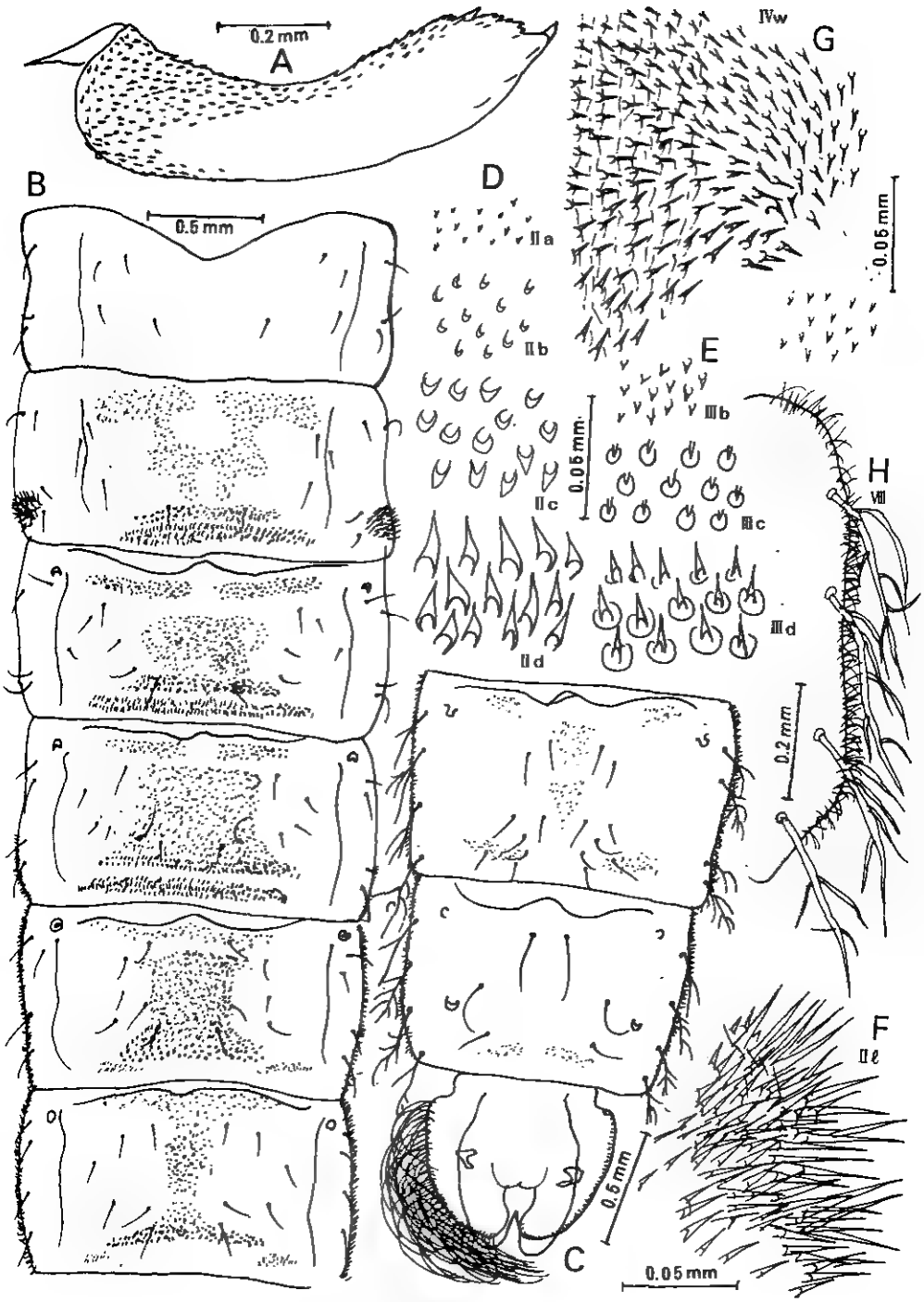

Fig. 94. ***Prodiamesa*** **sp. Pupa.**

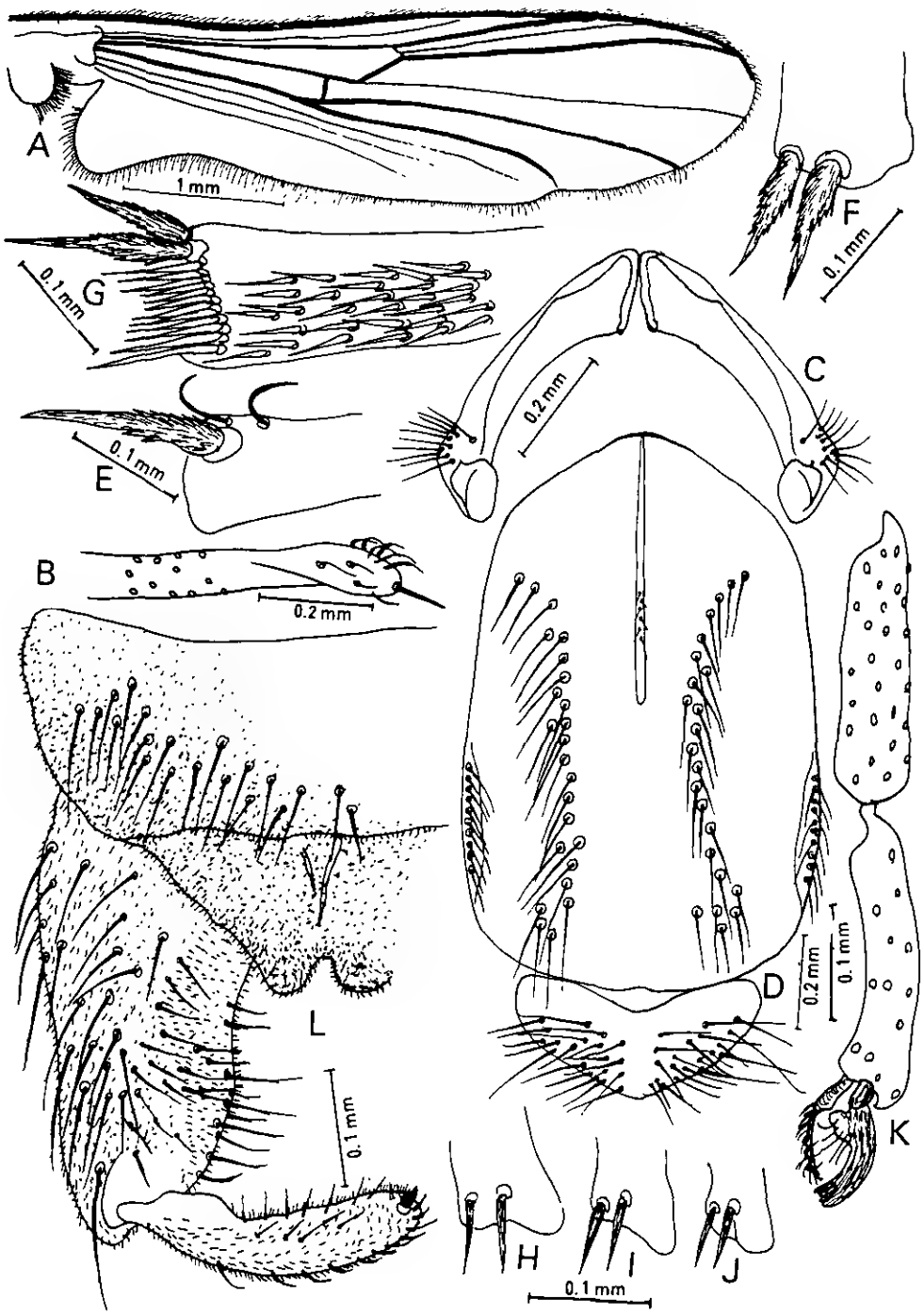

Fig. 95. ***Syndiamesa*** **sp. Male.**

日光国立公園の湖沼のユスリカに関する研究

第2部　日光国立公園の湖沼に生息するユスリカ類の分類学的、形態学的研究

佐々　学[1]

日光国立公園の湖沼のうち、とくに湯ノ湖と中禅寺湖を対象として、その湖岸に群飛ないし休息している成虫の捕集と、いろいろな深さの湖底から採集した底質にふくまれている幼虫を研究室内で飼育して成虫を羽化させ、かつサナギ、幼虫の脱皮殻を回収して標本にするという方法で、その各期について分類学的な検索をおこなった。その結果、今日までに41種のユスリカ科の生息をたしかめた。そのうち8種はヨーロッパ等との共通種とみなされたが、他は日本特産種と判断され、18種は新種として記載した。これらのうち、湯の湖には14種、中禅寺湖には32種の生息を認めたが、両湖に共通して見出されたのは6種にすぎなかった。こゝでも浅い富栄養湖と深くて大きい貧栄養湖のユスリカ相に大きな差がみられた。

1.　元国立公害研究所所長（富山医科薬科大学　〒930-01　富山市杉谷2630）

List of Publications

Studies on Chironomidae of Japan

Part 1 Sasa, M. and Y. Yamamoto (1977): A checklist of Chironomidae recorded from Japan. Jpn. Sanit. Zool. (Eisei Dobutsu), **28**, 301—318.

Part 2 Sasa, M. (1978): Taxonomical and biological notes on *Tokunagayusurika akamusi* (Tokunaga), with description of immature stages (Diptera, Chironomidae). Jpn. J. Sanit. Zool. (Eisei Dobutsu), **29**, 93—101.

Part 3 Sasa, M. (1978): A comparative study of adults and immature stages of nine Japanese species of the genus *Chironomus* (Diptera, Chironomidae). Res. Rep Natl. Inst. Environ. Stud., No. 3, 1—63.

Part 4 Sasa, M. (1979): Taxonomic accounts on the so-called *Chironomus dorsalis* complex of Japan (Diptera, Chironomidae), Jpn. J. Sanit. Zool. (Eisei Dobutsu), **30**, 187 192.

Part 5 Sasa, M. (1979): A morphological study of adults and immature stages of 20 Japanese species of the family Chironomidae (Diptera). Res. Rep. Natl. Inst. Environ. Stud., No. 7, 1 148.

Part 6 Sasa, M. and J. E. Sublette (1980): Synonymy, distribution, and morphological notes on *Polypedilum* (s. s.) *nubifer* (Skuse) (Diptera: Chironomidae). Jpn. J. Sanit. Zool. (Eisei Dobutsu), **31**, 93—102.

Part 7 Sasa, M., M. Yasuno, M. Ito and T. Kikuchi (1980): Studies on chironomid midges of the Tama River. Part 1. The distribution of chironomid species in a tributary in relation to the degree of pollution with sewage water. Res. Rep. Natl. Inst. Environ. Stud., No. 13, 1 -8.

Part 8 Sasa, M. (1980): Studies on chironomid midges of the Tama River. Part 2. Description of 20 species of Chironominae recovered from a tributary. Res. Rep. Natl. Inst. Environ. Stud., No. 13, 9—107.

Part 9 Sasa, M. (1981): Studies on chironomid midges of the Tama River. Part 3 Species of the subfamily Orthocladiinae recorded at the summer survey and their distribution in relation to the pollution with sewage waters. Res. Rep. Natl. Inst. Environ. Stud., No. 29, 1 —77.

Part 10 Sasa, M. (1981): Studies on chironomid midges of the Tama River. Part 4. Chironomidae recorded at a winter survey. Res. Rep. Natl. Inst. Environ. Stud., No. 29, 79—148.

Part 11 Sasa, M. (1983): Studies on chironomid midges of the Tama River. Part 5. An observation on the distribution of Chironominae along the main stream in June, with description of 15 new species. Res. Rep. Natl. Inst. Environ. Stud., No. 43, 1 —67.

Part 12 Sasa, M. (1983): Studies on chironomid midges of the Tama River. Part 6. Description of species of the subfamily Orthocladiinae recovered from the main stream in the June survey. Res. Rep. Natl. Inst. Environ. Stud., No. 43, 69 99.

Part 13 Sasa, M. and K. Ichimori (1983): Studies on chironomid midges of the Tama River. Part 7. Additional species collected in winter from the main stream. Res Rep. Natl. Inst. Environ. Stud., No. 43, 101—122.

Part 14 Sasa, M. & H. Hasegawa (1983): Chironomid midges of the tribe Chironomini recovered from sewage ditches, eutrophicated ponds and clean streams of the Ryukyu Islands, southern Japan. Jpn. J. Sanit. Zool. **34**, 305 —341.

Part 15 M. Yasuno, T. Iwakuma, Y. Sugaya and Sasa, M. (1984): Studies on the

distribution of chironomid midges in the lakes of the Nikko National Park.* Res. Rep. Natl. Inst. Environ. Stud., No. 70, 1 -17.

Part 16 Sasa, M. (1984): Taxonomical and morphological studies on the chironomid species collected from lakes in the Nikko National Park. Res. Rep. Natl. Inst. Environ. Stud., No. 70, 19—214.

Report of Special Research Project the National Institute for Environmental Studies

No. 1* Man activity and aquatic environment – with special references to Lake Kasumigaura – Progress report in 1976. (1977)

No. 2* Studies on evaluation and amelioration of air pollution by plants – Progress report in 1976-1977. (1978)

[Starting with Report No. 3, the title of NIES Reports was changed to :]

Research Report from the National Institute for Environmental Studies

No. 3 A comparative study of adults and immature stages of nine Japanese species of the genus *Chironomus* (Diptera, Chironomidae). (1978)

No. 4* Smog chamber studies on photochemical reactions of hydrocarbon-nitrogen oxides system – Progress report in 1977. (1978)

No. 5* Studies on the photooxidation products of the alkylbenzene-nitrogen oxides system, and on their effects on Cultured Cells – Research report in 1976-1977. (1978)

No. 6* Man activity and aquatic environment – with special references to Lake Kasumigaura – Progress report in 1977-1978. (1979)

No. 7 A morphological study of adults and immature stages of 20 Japanese species of the family Chironomidae (Diptera). (1979)

No. 8* Studies on the biological effects of single and combined exposure of air pollutants – Research report in 1977-1978. (1979)

No. 9* Smog chamber studies on photochemical reactions of hydrocarbon-nitrogen oxides system – Progress report in 1978. (1979)

No.10* Studies on evaluation and amelioration of air pollution by plants – Progress report in 1976-1978. (1979)

No.11 Studies on the effects of air pollutants on plants and mechanisms of phytotoxicity. (1980)

No.12 Multielement analysis studies by flame and inductively coupled plasma spectroscopy utilizing computer-controlled instrumentation. (1980)

No.13 Studies on chironomid midges of the Tama River. (1980)
Part 1. The distribution of chironomid species in a tributary in relation to the degree of pollution with sewage water.
Part 2. Description of 20 species of Chironominae recovered from a tributary.

No.14* Studies on the effects of organic wastes on the soil ecosystem – Progress report in 1978-1979. (1980)

No.15* Studies on the biological effects of single and combined exposure of air pollutants – Research report in 1977-1978. (1980)

No.16* Remote measurement of air pollution by a mobile laser radar. (1980)

No.17* Influence of buoyancy on fluid motions and transport processes – Meteorological characteristics and atmospheric diffusion phenomena in the coastal region – Progress report in 1978-1979. (1980)

No.18 Preparation, analysis and certification of PEPPERBUSH standard reference material. (1980)

No.19* Comprehensive studies on the eutrophication of fresh-water areas – Lake current of Kasumigaura (Nishiura) – 1978-1979. (1981)

No.20* Comprehensive studies on the eutrophication of fresh-water areas – Geomorphological and hydrometeorological characteristics of Kasumigaura watershed as related to the lake environment – 1978-1979. (1981)

No.21* Comprehensive studies on the eutrophication of fresh-water areas – Variation of pollutant load by influent rivers to Lake Kasumigaura – 1978-1979. (1981)

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